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EDITORIALS

BUSHINGS FOR FLEXIBLE CORD.

The use of flexible cord for connecting portable lamps and other devices is well nigh universal, and it is used in addition in many permanent installations, as where drop cords are used to suspend lamps and reflectors from outlet boxes or rosettes. Fused rosettes are now permitted only for open work in large mills, and unless inclosed fuses are used they are limited to circuits not exceeding 125 volts. Drop cords from outlet boxes are more common.

The National Electrical Code requires that the sockets used with flexible cord should have insulating bushings in the caps. In the smaller sizes of socket nipples the threaded bushings have been found unreliable because they are so easily broken. Most manufacturers of standard sockets make special caps for brass-shell sockets which are to be used as pendants and the bushings in these special caps are ordinarily superior to the threaded bushings used in threaded nipples, at least in the smaller sizes. Sockets with threaded nipples are made for use on fixture stems and similar mountings and their use should be confined to this application.

Flexible cords connected to outlet boxes were subjected to a new rule in the present edition of the Code, and this rule has been in force for more than a year. It provides that where flexible cord passes through the cover of an outlet box it must be protected by an approved bushing especially designed for this purpose. The use of a hard-rubber or composition bushing which is threaded into the box cover is not permitted. Experience has shown that such bushings are easily broken and are frequently found to be missing. Insulating bushings of porcelain are approved for this purpose, and equivalent protection is of course secured when the entire cover is made of porcelain. Covers having smooth metal bushings firmly spun into the hole, or formed in the metal of the cover itself, are also approved for this service. The Underwriters' Laboratories have made a ruling on this matter and interpret the Code Rule 32*h* to require either a bushing or a smooth, well rounded surface on which the cord shall bear. At the next revision of the Code the literal wording of this rule should be changed to correspond with this interpretation.

The same remarks apply to Rule 59*c*, which requires non-absorptive, non-combustible insulating bushings where flexible cord is brought from the end of metal conduit. When the entire fitting, or the cover through which the cord issues, is made of porcelain or other material with a smooth surface, the addition of a separate bushing is manifestly superfluous.

CONSOLIDATION.

Consolidation is the order of the day in all business. It has been manifest in the electric utility business, and especially so in recent years. It is especially suitable in electric service on account of the economies possible from centralized generation and management and the greater freedom from interruptions which is guaranteed by linking different generating stations and distribution systems together. The latest example is the proposed merger of the two St. Louis companies.

The greatest advantage in the local ownership of individual companies is their closeness to the public. The danger of holding companies, or of large consolidations, is that the management frequently gets out of touch with the consumers. In the inevitable spread of consolidation this danger should be realized and guarded against.

THE COST OF POWER AND OF COAL.

We have become accustomed in recent years to hearing of the cost of service in connection with the commission regulation of public utilities, and in many cases of rate fixing this cost has been definitely ascertained. Many of the elements of cost are readily agreed upon, such as what are known as operating costs. In addition to operating expenses and depreciation, allowance must also be made for the capital invested. In considering the capital upon which a return may be earned, intangibles as well as physical property must be considered, and among these intangibles some have maintained that franchise values should be considered, although the general attitude of state commissions has been to exclude any allowance for franchise value other than actual cash outlays connected with the obtaining of the franchise. Actual expense is recognized as a necessary cost, but such value as accrues from the right to occupy public highways or enjoy a monopoly in conducting the business is not generally recognized in rate-making cases.

That a similar element of cost enters into the price of commodities disposed of by private sale was clearly brought out in the paper by Messrs. Smith and Lesher on "The Cost of Coal" presented at the recent convention of the American Mining Congress. This was designated as "resource cost." It is the portion of the price which goes to the owners of the privilege of controlling this natural resource. This element of the price averages about 35 cents a ton for anthracite coal and 5 cents for bituminous coal, but in the case of certain mines is as high as $1.00 per ton. The other

elements of cost of coal are mining cost, transportation and marketing cost.

That this element of the retail price has been undergoing gradual increase is manifested by the valuation of coal lands. Coal lands in Pennsylvania have gradually risen from an initial price of $4 per acre to a present maximum of $3,000. Five-sixths of this rise has taken place since 1875. In the case of bituminous coal no such prices have been reached, nor is the royalty to the owners of coal land large, and since soft coal is largely used for power production the "resource" cost has not entered largely into the cost of power. The recent high prices of coal on the retail market have been due solely to local scarcity.

The obvious remedy for high costs of power arising from high prices for coal is to shut down small power plants and purchase power from large central stations. By purchasing coal in car lots directly from the mine the central station eliminates a large part of the marketing cost of coal, and by using large and efficient power-producing machinery it reduces the coal consumption necessary for the supply of a given amount of energy. The best turbogenerators utilize about 25 per cent of the heat delivered to them, and large modern boiler plants operate at about 80 per cent efficiency. This makes the overall efficiency about 20 per cent, or a station consumption of not much more than one pound of coal per kilowatt-hour. But such results can be obtained only from large stations operating under the best conditions. The small isolated plant will ordinarily use two or three times as much coal.

We are accustomed to hydraulic prime movers and to other forms of heat engines, but it has remained for an Italian to set the example of utilizing directly the heat in the interior of the earth as a substitute for coal. The incentive in Italy is great, as coal prices there are now of the order of $40 to $45 per ton. In Central Tuscany jets of hot steam issue from fissures in the ground and for some years this steam has been utilized to drive small engines. Lately borings have been made to get greater quantities of steam, the holes being as large as 20 inches in diameter and running several hundred feet into the earth. Pressures up to five atmospheres and temperatures of 150 to 180 degrees centigrade are obtained. The steam is applied to boilers, since it contains chemicals which would corrode turbine parts. Three 3,000-kilowatt turbogenerators are now in operation, the energy from which is transmitted to neighboring towns.

The heat of the earth is a resource of which little direct use has been made industrially. The idea of harnessing volcanoes for power generation is rather novel, and the uncertainty as to output and as to safety of the operator might stand in the way of the feasibility of such a scheme. It is quite likely that borings in the vicinity of Yellowstone Park would show the possibility of power generation without fuel cost, but power to be valuable must be delivered where there is a market for it.

NOISE IN ELECTRICAL MACHINERY.

If dirt is matter out of place, noise may be defined as sound out of place—not in the sense of location, for it may be more appropriate to its actual surroundings than to other environment, but in the sense of undesirability and unfitness to an ideal scheme of things. Noise is objectionable on three grounds. In the first place it represents a dissipation of energy without useful result and hence contributes to inefficiency. Quantitatively this is of small importance. In the second place it is unpleasant and produces a sense of discomfort with an accompanying distraction of attention. In the third place, and arising at least partly from the last consideration, it reduces the time during which human beings can apply themselves continuously at a task without becoming fatigued, and consequently it reduces human efficiency. This is a consideration which should have the attention of factory managers.

Noise has one advantage in some instances, in that it serves as a warning. For example, it may indicate that a vibration is going on which may weaken some members of a machine, or that lubrication is needed. To take advantage of such service the noise must be stopped. In all cases, then, noise would better be eliminated. This idea is gradually gaining ground and measures are being taken to discover the sources of noise and to remove them. The American Electric Railway Association had a committee report a few years ago on the cause of squeal from car wheels. The Public Service Commission for the First District, New York, has a committee at work making a study of the causes of noise in surface, elevated and subway cars, so that changes in structure, equipment and methods of operation may be adopted to reduce the nuisance. Engineers are giving their attention to the reduction of noise in machinery, and in Berlin a corporation is in business for the sole purpose of avoiding noise and vibration. Just as the efficiently busy factory can no longer be pictured with a smoking chimney, soon it must be imagined without the roar and the clang. Such changes may grate upon the conceptions of the artist, but they will be pleasing to others.

In electrical machinery many sources of noise are avoidable, and if changes of construction are possible to accomplish this, such modifications should be made. Noise may arise through agitation of the air, through magnetic vibrations of the core, or through vibrations of other parts. American designs of induction motor are sometimes more noisy than European designs, on account of using open slots rather than closed slots. Silent running can practically be obtained only in machines of small output, but frequently it is not obtained even here.

Magnetic noises are the most frequently objectionable and range from a moderate hum to notes of high pitch, due to a high-frequency pulsating field. They are difficult to foresee and eliminate, but German tests have shown the desirability of keeping the magnetic flux uniform for all positions of the armature. This means

that one slot should not depart from one pole tip at the instant when another slot arrives at the same position under another pole tip, and the number of slots should be chosen accordingly. The slot pitch should not be greater than 16 millimeters. Magnetic noises can sometimes be eliminated by the use of slot wedges of magnetic material. Spiralling the slots is another effective remedy, and it is helpful to keep the flux-density in the teeth relatively low. The number of slots should not be less than three per pole per phase. For equal numbers of poles and equal flux-density a 25-cycle machine is less noisy than a 60-cycle machine, the speed of course having a vast influence.

Smooth surfaces and the avoidance of sharp corners will help to diminish the noises arising from air motion. Such noises are often increased by the ventilating ducts, but the closing of these is of course out of the question. Perfect electrical and mechanical symmetry will avoid other sources of vibration and noise and this should of course constitute an ideal in construction. Symmetrical windings assist in achieving this end, as do also the equalizing connections. A change in number of phases will sometimes restore disturbed symmetry and in some cases an increase in air gap proves beneficial.

COMPETITIVE BIDDING ON ELECTRICAL CONTRACTS.

In cases of competitive bidding the successful bid may be put in one of three classes. The first class comprises those bids which are deliberately made low with the idea of adding enough extras at excessive prices to permit the contractor to finally come out with a profit. The second class consists of those bids which are made through ignorance, recklessness, or incompetence, and are made below cost with the sole idea of getting the contract regardless of price. They are usually made without a definite knowledge of costs, or with an intention to depart sufficiently from specifications to cover what would otherwise be a loss on the job. The third class is made up of bids which really win on their merits. They result from planning and estimating which is so carefully and thoroughly done that the costs are accurately known and the percentage for contingencies is small. They are put in by contractors who manage the work so ably that there is a minimum of waste of material and no avoidable loss of workmen's time.

Contractors who submit bids coming under the first classification are generally regarded as disreputable, and as taking an unfair advantage of both customer and other contractors. The success of their method is dependent upon faulty specifications, change of plans after the contract is awarded or ignorance of the customer. They do not expect to get any repeat orders and depend for business upon catching fresh, unsuspecting customers. The method is not honorable and is not countenanced by reputable contractors. A particularly objectionable form of this practice has recently come to light in Massachusetts, as was noted in a recent issue. The Massachusetts Electrical Contractors' Association has condemned this practice and is seeking a method to eliminate it.

Contractors who keep cost figures and know how to make an accurate estimate deplore the existence of the second class of electrical contractors and are endeavoring, through local and national organizations, to educate all contractors out of this class. Where it is intended to make up any deficit by skimping on materials or workmanship, this method is of course just as dishonorable as that discussed in the previous paragraph and is just as great a menace to the industry. In many cases, however, a low bid is made through ignorance of costs or merely to meet another bid or supposed bid, and without any intention of dishonesty. In the end the honest contractor of this type is likely to become bankrupt, but in the meantime he upsets the stability of business and of prices.

If persons letting contracts were always sure that the lowest bidder belonged to the third class, they would have a justification for the system of competitive bidding. The contractor of this class sees that his work is executed under the most favorable conditions and his costs are actually less than those of many competitors. He sees that the work is done promptly to avoid any increase of costs from changing conditions after the estimate is drawn up. He avoids unnecessary overhead expense, buys his materials in large quantities and to the best advantage, has workmen who are well selected and organized, and store room and delivery service are coordinated with the construction work. The whole management breathes efficiency. The advantage of the unusual efficiency should go to the management responsible for it, but instead it goes, at least in part, to the customer.

Unfortunately for the system of competitive bidding, the bid goes more often to a contractor in the first or second class than to one in the third. Those who can qualify in the third class are fewer in number and are usually underbid by the other classes. If the lowest bidder is to get the contract, it will seldom be the most competent contractor. If the latter be known and the contract awarded to him anyhow, then the competition in bidding is useless and a needless waste of estimating is encouraged. By far the best plan in letting a contract is to select the contractor who, by past experience, is known to be able to do the work well and efficiently and to be honest and reliable. Then a satisfactory job is assured at a reasonable cost. At most, bids should be secured from two or three such selected firms. General adoption of such a practice would soon eliminate from the field the ignorant, the incompetent and the dishonest contractor, and would greatly raise the general standard of work in electrical construction as well as the standing of the business.

Happenings in the Industry

Merger of Union Electric Light & Power and Electric Company of Missouri—Municipal Plant for Memphis Abandoned—Percentage of Residence Customers to Total Population Low—To Protect Utility Investments in Kansas—Cost of Reproduction of Washington Plant—Cost of Coal Discussed—Miscellaneous News Notes

MERGER OF ST. LOUIS CENTRAL-STATION COMPANIES TO BE MADE.

Plans Outlined for the Consolidation of the Union Electric Light & Power Company and the Electric Company of Missouri.

A merger of the Union Electric Light & Power Company, which serves the city of St. Louis, Mo., and the Electric Company of Missouri, serving St. Louis County, is announced, through which the latter company is to lose its identity. Both companies are subsidiaries of the North American Company. According to Charles S. Ruffner, vice-president and general manager of the Union Electric, the consolidation details have been entirely completed and the actual merging of the two companies now awaits the adjustment of certain incidental legal phases.

The Union Electric Company has an authorized capital stock of $18,000,000, and lately reached a total of 75,000 customers. The Electric Company of Missouri has a capital stock of $3,650,000, and serves about 10,000 customers. James D. Mortimer, president of the North American Company, is also president of both the Union Electric Company and the Electric Company of Missouri.

Under the plan of the merger, which will be submitted to the Missouri Public Service Commission in January, the Union Electric Company will take out a revised charter permitting it to do business outside of the city of St. Louis, and will then purchase the property and business of the Electric Company of Missouri. Payment to the latter company will be made in Union Electric securities which are to be issued for that purpose. The amount to be paid to the company will be less than the total of its present outstanding securities—subject to the approval of the Public Service Commission. On receipt of these Union Electric securities as payment for its property and business, the Electric Company of Missouri will retire its present outstanding securities and discontinue business, the Union Electric Company taking over the Electric Company of Missouri contracts, including the Keokuk power contracts. Both companies are owned by the same stockholders, the Electric Company of Missouri having been organized to develop electric service outside of the city of St. Louis, since the Union Company's charter did not permit it to enter that field.

The St. Louis contracts for Keokuk power were made prior to the time that the Keokuk plant was built, at rates based mainly on engineers' estimates. However, the Keokuk company has had to expend many millions of dollars more to develop 100,000 horsepower than was originally contemplated for the development of 200,000 horsepower, and it is due to this combination of facts that the consumers in St. Louis and the St. Louis district are receiving power at rates which are lower than those charged by electric service companies for similar power service in any other large city.

Keokuk power is being delivered to the Union Electric through the Electric Company of Missouri at a slight advance over the charge made to the Electric Company of Missouri by the Keokuk company. This advance is necessary as a matter of bookkeeping and to cover the cost of transforming the high-voltage Keokuk power. However, since both companies are owned by the same stockholders, and on account of this slight advance charge made by the county company to the Union Electric, impression has been current that the two companies were being operated by the same owners solely to impose an additional inter-company charge on the St. Louis users of Keokuk power. The merger of the two companies, will, obviously, remove the cause of this misunderstanding, and as a result of a natural decrease in management expense will mean a rate reduction to consumers.

Southern Engineering Association Disbands.

The Engineering Association of the South will be disbanded on January 1, a large majority of its members having voted for this step on a poll recently completed. The association at the present time has only two sections, these being at Nashville and Atlanta.

The Engineering Club, of Nashville, will take the place of the Nashville section, while a similar organization is planned at Atlanta. The Nashville body has arranged to take quarters in the new Commercial Club Building, which will be devoted to civic organizations.

The Engineering Association of the South was organized at Nashville August 13, 1889.

In accord with its annual custom, the **Street-Lighting Schedules for 1917** *The tables are published in very convenient booklet form. If desired, the tables proper can readily be detached and mounted on the wall, since they are published on a single sheet. The tables are so spaced as to serve also as a calendar for the whole year. The booklet should be retained, however, for the information it contains.*

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN *has compiled street-lighting tables for the year 1917. These give the time for lighting and extinguishing lamps on the all-night schedule and the so-called Philadelphia moonlight schedule for every night of the year. Simple rules are also given whereby these tables can be used for two other schedules, a simplified form of the Frund schedule and the moonlight-midnight schedule. The total number of hours of lighting are given for each month and for the whole year for the two main schedules and for the two derived schedules.*

As usual, each subscriber of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN *is entitled to one copy of these tables, which will be sent to him free on request. Additional copies can be obtained at 10 cents each. Copies can also be secured by anyone else at the same price.*

MUNICIPAL PLANT FOR MEMPHIS ABANDONED.

City Decides to Adopt Proposals of Existing Utilities Thereby Saving Considerable Money for Taxpayers.

By an agreement completed December 11, the city of Memphis, Tenn., has withdrawn its project for the construction of a municipal lighting plant, and has amended the franchises of the Merchants Power Company and the Memphis Consolidated Gas & Electric Company, which will be united, to provide for a reduced scale of rates. This agreement ends negotiations extending over a year, covering, first, a proposal to purchase the Merchants Power Company and later the plan of constructing a municipal plant. The city has already sold a $1,000,000 bond issue for the purpose of financing the construction of its own plant. There was a large amount of opposition among business men to this step, and when suggestions were offered for a compromise, negotiations with the companies, which had been stopped, were resumed. It was considered, both by citizens and by representatives of the companies, that a municipally owned plant would bring about a rate war that would be disastrous to all the interests involved and, in the end impose a burden on the public.

The new rates include a service charge of 30 cents as a new feature. For the first 80 kilowatt-hours the rate is six cents; for the next 120, five cents; for the next 300, four cents, and for all in excess, three cents. It is provided, however, that in no case shall the current charge, plus the service charge, be greater than an average charge of 7.5 cents per kilowatt-hour. There is no minimum bill. No change is made in power rates, the existing schedule being already comparatively low.

In addition to the reduction in rates, which is about one-third, the companies will pay the city a bonus of $100,000, made up of $40,000 in cash and $10,000 a year for six years. The rate for street lighting is reduced to $50 per year, this being for 600-candlepower gas-filled lamps. The city must pay a penalty of $15,000 to the purchaser of the lighting bonds to be relieved of this obligation.

The consolidation of the two companies will not affect their operation, as the Merchants Power Company owns the Consolidated company. The franchise of the company is to be extended to 1943. The agreement goes into effect January 1, 1917.

PERCENTAGE OF RESIDENCE CUSTOMERS TO POPULATION SERVED LOW.

Statistics Prepared by the Society for Electrical Development Show a Vast Field Still Available for Acquisition of Residence Business.

Statistics recently compiled by the Society for Electrical Development, showing the population served and number of residence customers of central-station companies in a majority of cities of the United States, indicate in a very convincing manner that there is a vast field still available for the acquisition of residence business. While it would be difficult to arrive at a figure that would represent average conditions throughout the country, the statistics show that in the eastern states the percentage of residences served to the total population is, with but few exceptions, less than 15 per cent, while in the western states the relation of residences served to the total population is 15 per cent or more.

The state of California may be taken as typical of the western states. Of the 21 companies listed, six show a percentage less than 15 per cent of the residences served to the total population, while the average percentage in the remaining localities is 21. Approximately the same conditions obtain in all of the states west of the Mississippi.

We present herewith a list of companies serving cities of 100,000 population and more, showing conditions which have been found to obtain by the Society:

Town.	Name.	Population	Residences Served.	Per cent.
CALIFORNIA—				
Los Angeles	Southern California Edison Company	800,000	90,000	11.2
COLORADO—				
Denver	Denver Gas & Electric Light Company	250,000	40,000	16.
CONNECTICUT—				
Waterbury	United Electric Light & Water Company	100,000	2,735	2.7
DELAWARE—				
Wilmington	Wilmington & Philadelphia Traction Company	150,000	9,000	6.
DISTRICT OF COLUMBIA—				
Washington	Potomac Electric Power Company	380,000	18,605	5.
GEORGIA—				
Atlanta	Georgia Railway & Power Company	185,000	9,000	4.9
ILLINOIS—				
Chicago	Commonwealth Edison Company	2,185,283	286,202	13.1
INDIANA—				
Indianapolis	Merchants Heat & Light Company	233,650	28,000	12.
KANSAS—				
Kansas City	Municipal Light Company	100,000	6,800	6.8
KENTUCKY—				
Louisville	Louisville Gas & Electric Company	300,000	23,000	7.7
MASSACHUSETTS—				
Boston	Edison Electric Illuminating Company, of Boston	826,801	42,270	5.1
Brockton	Edison Electric Illuminating Company	101,000	2,800	2.8
Cambridge	Cambridge Electric Light Company	108,000	5,000	4.6
Fall River	Fall River Electric Light Company	126,000	4,352	3.5
Lowell	The Lowell Electric Light Corporation	127,271	2,600	2.2
New Bedford	New Bedford Gas & Edison Light Company	150,000	2,000	1.33
MINNESOTA—				
Minneapolis	Minneapolis General Electric Company	500,000	30,000	6.
MISSOURI—				
Kansas City	Kansas City Electric Light Company	248,381	30,000	12.
St. Louis	Union Electric Light & Power Company	800,000	75,000	9.3
NEW YORK—				
Buffalo	Buffalo General Electric Company	423,715	18,500	4.4
Geneva	Empire Gas & Electric Company	100,000	5,000	5.
Schenectady	Schenectady Illuminating Company	100,000	15,000	15.
NORTH CAROLINA—				
Raleigh	Carolina Power & Light Company	111,000	7,000	6.3
OHIO—				
Cleveland	Cleveland Electric Illuminating Company	560,663	65,010	11.6
PENNSYLVANIA—				
Allentown	Lehigh Valley Light & Power Company	125,000	11,416	9.1
Philadelphia	Philadelphia Electric Company	1,549,008	63,527	4.1
Scranton	Scranton Electric Company	250,000	13,000	5.2
TEXAS—				
Dallas	Dallas Electric Light & Power Company	130,000	17,500	13.5
Fort Worth	Fort Worth Power & Light Company	100,000	7,000	7.
UTAH—				
Salt Lake City	Utah Power & Light Company	270,000	41,885	15.5
WASHINGTON—				
Seattle	Municipal Electric Light Plant	350,000	35,000	17.9
Tacoma	Municipal Plant	120,000	20,000	16.6
WISCONSIN—				
Milwaukee	Milwaukee Electric Railway & Light Company	373,857	24,000	6.4

TO PROTECT UTILITY INVESTMENTS IN KANSAS.

Kansas Public Service Association in Annual Convention Votes to Present Bill to Legislature.

The Kansas Public Service Association held its nineteenth convention in Topeka, December 7, 8 and 9, and it was successful in point of interest, attendance, and subjects discussed. There were 150 delegates present.

The chief subject of discussion was the protection of investors in public utilities. The convention decided on the appointment of a committee to prepare the outline of a law to be presented to the next legislature. This law will embody the provision that cities may grant indeterminate franchises to utilities, revocable when the company does not live up to its obligations. Prof. F. W. Blackmar, of the Kansas State University, delivered an address on the indeterminate franchise, which led the convention to this action —previous and later discussion crystallizing from the definite data of the university man's talk. Professor Blackmar declared that a public utility should be a monopoly as long as it gives fair treatment, and that the public utilities commission should protect the investors who had made it possible for the public to receive the service. He pointed out the injustice, both to the public and the industry, of the long-term franchise; and the equally grave dangers of the short-term franchise, which prevented a company securing the needed financial support to make adequate progress and discouraged maintenance.

H. B. Wright, formerly of Kansas City, head of a large investment company, declared that the franchise system had cost investors millions, and had caused communities to suffer.

Professor Shaad, head of the electrical engineering department of the University of Kansas, stated that the indeterminate franchise is the practical way out of a dilemma, and as the result of the discussion it was decided that an indeterminate franchise law should be drafted and that it should be brought to the attention of the next Legislature.

In a paper on "Joint Use of Electric Light and Telephone Poles," with slides to illustrate it, J. P. Kobrock, division plant engineer of the Missouri & Kansas Telephone Company at St. Joseph, Mo., cited as the monetary advantages of joint construction, the elimination of unsafe conditions, forestalling of public agitation for the removal of poles.

Charles A. Stanley, industrial engineer of the Kansas Gas & Electric Company, described the use of "Electric Power in the Oil Field," emphasizing the difficulties of securing business from the older oil men. His company now has 103 horsepower in water pumping in the El Dorado field and in one instance was able to show a cost of $82.50 per month for electric operation as compared with a former steam cost of $321.20 per month.

There were several instructive technical addresses, but in the main the meetings took up the more general aspects of the business, especially those of the relations of the companies to the public. One of these was by W. N. Matthews, of St. Louis, on "Good Will—The Greatest Business Factor." Other speakers were L. O. Ripley, Wichita; M. A. McLachlan, Detroit; E. T. Forman, Kansas City; F. B. Uhrig, Kansas City, and G. B. Muldaur, field secretary of the National Electric Light Association.

A. H. Purdy, president, presided at the sessions. The new officers elected are:

President, W. R. Waggoner, Salina.
First vice-president, C. L. Brown, Abilene.
Second vice-president, Otto Theis, Dodge City.
Third vice-president, H. L. Jackman, Minneapolis.

The Executive Committee will appoint the secretary and treasurer. The next session will be held at Salina, October 19 and 20, 1917.

Research Fellowships in Engineering Experiment Station, University of Illinois.

To extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains 14 Engineering Experiment Station research fellowships. These fellowships, for each of which there is an annual stipend of $500, are open to graduates of approved American and foreign universities and technical schools. Appointments are made and must be accepted for two consecutive collegiate years, at the expiration of which, if all requirements have been met, the degree of Master of Science will be conferred. Not more than half of the time of the research fellows is required in connection with the work of the department to which they are assigned, the remainder being available for graduate study.

Nominations to these fellowships, accompanied by assignments to special departments of the Engineering Experiment Station, are made from applications received by the director of the station each year not later than the first day of February. The nominations are made by the station staff, subject to approval by the university executive authorities. Preference is given those applicants who have had some practical engineering experience following undergraduate work. Appointments are made in the spring, and they take effect the first day of the following September.

The Engineering Experiment Station, an organization within the College of Engineering, was established in 1903 for the purpose of carrying on investigations in the various branches of engineering and for the study of problems of importance to engineers and to the manufacturing and industrial interests of the state. Research work may be undertaken in architecture, architectural engineering, ceramic engineering, chemistry, civil engineering, electrical engineering, mechanical engineering, mining engineering, municipal and sanitary engineering, physics, railway engineering, and in theoretical and applied mechanics.

Additional information may be obtained by addressing the director, Engineering Experiment Station, University of Illinois, Urbana, Ill.

Estimates Prepared on Reproduction Cost of Potomac Electric Power Company's Plant.

Twenty-three million dollars is the approximate estimated cost of reproducing the property and business of the Potomac Electric Power Company, as of July 1 last, according to an investigation conducted by Harold Almert, consulting engineer, of Chicago, report of which has been presented to the Public Utilities Commission. The report increases the reproduction cost as estimated by the valuation bureau of the commission by more than $6,000,000.

Mr. Almert estimates the cost of the land and reproduction of buildings, machinery, overhead and underground lines, stores, working capital, etc., to be $16,922,522.63, to which he has added the cost of organizing the company, cost of financing, cost of developing the business, etc., making a total estimated cost to reproduce the property and business of the company of $23,235,387.63. The figures of the valuation bureau of the commission, submitted several months ago, showed the estimated cost to reproduce the physical property of the company to be about $10,000,000. This estimate does not include any amounts for the cost of organizing the company, cost of financing or cost of developing the business. For these items Mr. Almert allows more than six million dollars, which brings the total up beyond the twenty-three-million mark.

Two years ago Mr. Almert began the work of placing a valuation upon the properties of the Potomac Electric Power Company. His report estimates a valuation as of July 1 last, whereas the company, it is understood, will emphasize the fact that the commission's report is of July 1, 1914, and does not represent present value, inasmuch as it does not make allow-

ance for additions to the property of the company since that date.

Among the principal items of the Almert report are cost of reproducing real estate, $830,967.44; buildings, $1,095,682; power plant and equipment, $2,246,816.86; transmission and distribution system, $7,152,312.38.

With respect to organization and other expenses, which the company claims are required by the utilities act to be valued, but which are not contained in the report of the valuation bureau, Mr. Almert's report contains the following allowances: Legal organization and franchise expense, $262,542; financing, expense of negotiating only, $60,000; compensation to conceivers, $650,000; preorganization expense, $25,000; brokerage and commissions, $700,000; development cost, $2,500,000.

THE COST OF COAL.

A Resumé of the Fuel Situation and How Public Utility Companies Are Affected.

Under this title a paper was presented by George Otis Smith and C. E. Lesher, of the United States Geological Survey, at the American Mining Congress, which met in Chicago last month. After giving statistics of consumption, it was stated that, looking backward as well as forward, one need not be an alarmist to suggest that in the whole field of productive business the coal industury seems the one most likely to be threatened with government operation.

The price of coal depends upon the balance between necessity for fuel on the one hand and ability to produce and to deliver on the other; the ability to produce is in turn controlled by the labor available and the ability to deliver is dependent upon car supply. Increased foreign demand for American coal, large industrial consumption, unusual weather—all may have great influence on the current price of coal, but none of these is to be considered a factor in the actual cost of production except so far as it causes irregularity in operating expenses and promotes a decrease in efficiency of mine labor.

Four general items of cost must be considered as normally controlling the price of coal to the consumer—resource cost, mining cost, transportation cost, and marketing cost. Under usual conditions each of these items includes a margin of profit which may seem either excessive or inadequate, according to your point of view. Yet an unbiased consideration of these cost items is absolutely essential as a preliminary to the decision by the public whether we are buying coal at a fair price, and if not, why not. As long as it is the popular view that the price of coal is made up of one part each of mining costs and freight costs to two parts each of operator's profits and railroad dividends, with the cost of a certain amount of needless waste on the side, the demand for investigation will continue, and in so far as there is any element of truth in this view, legislative action is justified, even though the prescribed reform may approach the extreme of public ownership and operation of mines and railroads.

As the initial item of cost, the amount charged against the marketed product as the value of the coal in the ground, which for brevity may be termed the resource cost, is perhaps the item most often overlooked by the coal consumer. The other items need less discussion in this paper for several reasons: the item of marketing cost is one that can be brought directly under observation by the consumer if he will but study the matter intelligently, the transportation cost can be learned by simple inquiry and its control lies within the province of the Interstate Commerce Commission, and the details of mining cost can best be set forth by the mine operators themselves.

It is not practicable to assign a very exact figure to the mining cost—the census of 1909 indicated an average of $1 a ton for bituminous coal and $1.86 for anthracite, but these figures are believed by some operators to be too low. It is possible, however, to show in a general way the distribution of this item; the cost of mining is divided between labor, 70 to 75 per cent; materials, 16 to 20 per cent; general expense at mine and office and insurance, two to four per cent; taxes, less than one per cent to three per cent for bituminous coal, and three to seven per cent for anthracite; selling expenses, nothing to five per cent and indirect cost of workmen's compensation, which may reach five per cent for bituminous coal.

The cost of selling coal is nothing for the companies that use their own product, including the steel corporation and a large number of others, and is little or nothing for the producers who sell nearly all their coal to such large consumers as the railroads. Companies that produce coal for domestic use and the general run of steam trade must figure on a selling cost as high as 10 cents or more per ton, the cost depending on the extent of their business. The average selling cost for bituminous coal is probably five to 10 cents a ton, and for anthracite the usual charge of sales agencies is reported as 10 cents a ton for steam sizes and 15 cents for the prepared sizes.

The producers of coal and the transportation companies are concerned not so much with the actual rates charged for carrying coal as with the adjustment of rates between coal fields and between different markets. In the many years in which our coal industry has been developing, rate structures have been built up that give to this and that producing district differentials over other districts. The consumer of coal, however, is interested in the actual rather than the relative freight rate.

To help toward a realization of the magnitude of this transportation item, it may be pointed out, first, that all but 14 per cent of the output of the country's coal mines, aggregating 532,000,000 tons, is moved to market by rail or water, and second, that nearly half of the bituminous coal (47 per cent in 1915) and more than two-thirds of the anthracite (71 per cent in 1915) is shipped outside of the states in which it is produced.

In the interstate traffic, both rail and water, bituminous coal probably pays an average freight of nearly $2 per ton. In other words, the transportation costs more than the product, and, as some parts of the country are just now learning, is sometimes more difficult to obtain.

There now remains to be considered the first major item, or the resource cost, which is what the operator has to pay for the coal in the ground—the idle resource, which he starts on its career of usefulness. This cost is expressed as a royalty or a depletion charge.

One of the latest leases by a large coal-land owner provides for the payment of 27 per cent of the selling price of the coal at the breaker. This percentage is therefore not only a royalty figured on the mineral resource, but also a commission based on the miner's wage. To bring this right home to you and to me, it may be said that the practical result is that if the anthracite we burn in our range this winter happens to come from that particular property, we will pay fully $1 a ton into the treasury of the city trust that owes its existence to the far-seeing business sense of a hard-headed citizen of Philadelphia. Whether such a royalty is excessive or not the fact remains that this is the tribute paid to private ownership.

The present average rate of royalty on anthracite is probably between 32 and 35 cents a ton on all sizes, which is from 12 to 14 per cent of the selling value at the mine. The minimum rate (about 10 per cent) is found in some old leases, and the maximum (20 to 27 per cent) in leases made in the last five years. The tendency is still upward by reason of increases in the rates for intermediate sizes and the operation of royalty rates based on a percentage

of the selling value, an increasing quantity. Figured on the output from the Girard lands, which is nearly three per cent of the total production, the gross return to the estate from its coal lands is over 50 cents a ton.

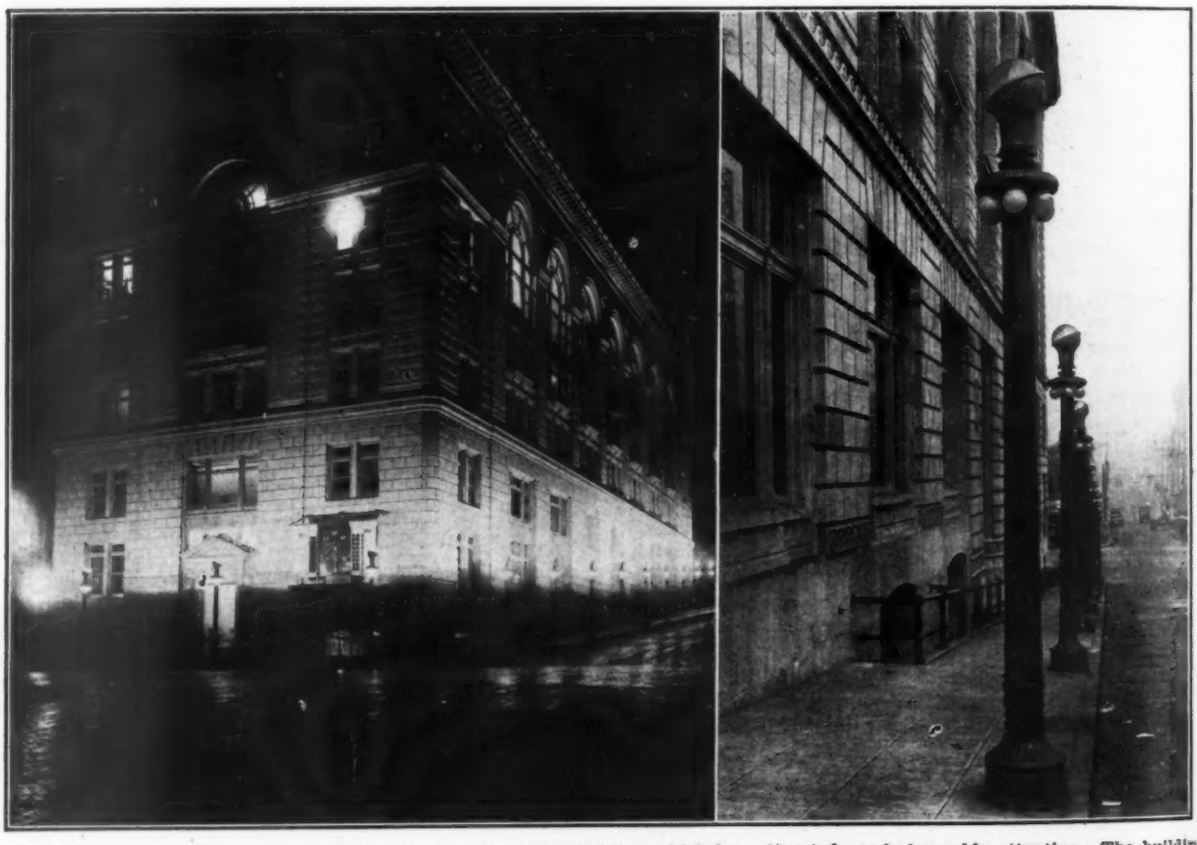
Nor is the increase in value of anthracite lands any less striking. At the beginning of the last century, as stated by Mr. Norris, the great bulk of these lands were patented by the state of Pennsylvania for $2 to $4 an acre; in the middle of the century the price of the best land rose to $50, and in 1875 even to $500. Now $3,000 an acre has been paid for virgin coal land, and little is on the market at that.

The bituminous coal industry is a modern institution compared with the mining of anthracite, and much of the bituminous coal land was acquired by the operating companies during the last 20 years for little if anything more than its surface value. Today there are large areas of bituminous coal-bearing lands that, because they are undeveloped and without railroads, can be purchased at a low price, but little or no anthracite land is on the market and little has changed hands for years. The present average resource cost of bituminous coal is not much over five cents a ton, or about four per cent of the average selling value at the mine. In the Pocahontas region and the Pittsburgh district the royalties are much higher, but these like others that might be cited, are exceptions—one due to coal of special quality, and the other to location—factors which, incidentally, are exactly those that have assisted in making the resource cost of anthracite what it now is.

Competition seems to have failed of late years to benefit the consumer of coal. In the bituminous fields the competition whenever present has been wasteful and in the anthracite fields there has been practical absence of healthy competition, and whether too great or too little competition, the result is the same—to increase the actual cost of bituminous coal by saddling the industry and its product with the fixed charges on idle or semi-idle mines and to raise the price of anthracite coal by favoring the burdens of high resource costs.

As coal is more an interstate than intrastate commodity, any regulation of prices needs to be under federal control, and to benefit both consumer and producer such control cannot stop with transportation and mining costs, but must stand ready to exercise full rights as a trustee of the people over the coal in the ground. The private owner of coal land, which derives its real value from society's needs has no more sacred right to decide whether or not that coal shall be mined when it is needed by society or to fix an exorbitant price on this indispensable national resource than the coal operators have to combine for the purpose of exacting an excessive profit from the consumer, or the railroads to charge all that the traffic may bear. The proposal to bring the land owner under the same rule as mine operator and coal carrier may seem radical, but where is the point at which coal becomes the resource upon which industrial society depends for its very life?

Unusual Flood Lighting of Seattle Building



The Seattle *Daily Times* has installed a system of exterior lighting which has attracted much favorable attention. The building is of light buff terra cotta and triangular or flat-iron shaped, located at Third Avenue and Olive Street. It was necessary to install some form of ornamental pole to illuminate the street and it was decided to illuminate the exterior of the building as well. Union metal standards were installed on 20-foot centers entirely around the building, using the poles as designed except for the top ball which was removed and a special flood-lighting reflector installed, designed to throw the light in an upward direction. The whole unit is adjustable so that the light can be reflected on the building uniformly. The poles were furnished by the Pacific States Electric Company and installed by J. J. Agutter & Company. The flood-light reflectors were designed and installed by Marsden & Norton. This unique method of flood lighting a building was first used for the triangular building of Klee Brothers, on Milwaukee Avenue, Chicago. The installation in this case was designed by J. R. Cravath, illuminating engineer, and was described and illustrated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 16, 1915.

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Miscellaneous NEWS NOTES

Value of Public Utility Securities.—William H. Black, of San Antonio, Tex., addressed the Dallas (Tex.) Electric Club and Jovian League on December 15, his subject being "Electricity as a Legitimate Field for Investment."

Memphis Jovian Elects New Officers.—The Jovian League of Memphis, Tenn., has elected and installed new officers as follows: President, C. K. Chapin, re-elected; first vice-president, Burns Stewart; second vice-president, Joseph Fowler; third vice-president, William Slater; secretary, Hugh Street, and treasurer, Andrew Myers.

Straw Vote Results in Favor of Central Station.—A straw vote taken in Dallas, Tex., resulted almost unanimously in favor of the Dallas Electric Company's valuation of $8,500,000 for its properties. Of 15,260 votes cast, 95 per cent were in favor of the company's figures. The City Council probably will grant new franchises based on this valuation.

Interesting Meeting of New York Companies Section, N. E. L. A.—Over 300 were present at the December 19th meeting of the New York Companies Section, N. E. L. A., at which Theodore Rousseau, secretary to Mayor Mitchel of New York City, spoke on "City Government," and F. M. Feiker, editor of *Electrical World*, spoke on "The Electrical Industry." The new name for the N. E. L. A. *Bulletin* was announced as "Voltage," the prize-winning suggestion being that of Arthur H. Miller, of the New York Edison Company.

St. Louis Section, A. I. E. E., Elects Officers.—At a meeting of the St. Louis Section of the American Institute of Electrical Engineers, held December 6, A. McR. Harrelson, chief electrical engineer of the Emerson Electric Manufacturing Company, was elected chairman for the year 1917, and H. L. Hope, equipment engineer of the Southwestern Bell Telephone System, was elected secretary. The retiring officers are W. O. Pennell, chief engineer of the Southwestern Bell Telephone System, chairman, and George McD. Johns, superintendent of Fire and Police Telegraph Department, City of St. Louis, secretary.

Ordinance for Suburban Railroad Electrification Pending in Chicago.—A contract ordinance covering important lake front and railroad terminal improvements in Chicago has been submitted to the City Council by the Illinois Central Railroad. It provides, among other things, for the construction of a new terminal station involving an expenditure of about $20,000,000. In connection therewith the railroad offers to electrify its extensive suburban train service and seeks to construct an underground loop for these trains under the northeast portion of Grant Park. This verifies the statement made in these columns a few weeks ago that the long agitation for electrification in Chicago is soon to see an actual, even if only initial, realization.

Employees' Profit-Sharing Plan Announced by St. Louis Company.—The Union Electric Light & Power Company, St. Louis, Mo., has for the past two months been increasing the salaries of 1,100 of its 2,500 employees, the increases made totaling $125,000, about 14 per cent of the present year's payroll. The exact percentage of the increases is not available, since adjustments were necessary to meet the different plans of payment obtaining in the various departments—some employes being paid monthly, some weekly, and some on a part commission basis. Approximately 1,500 of the Union Company's employees are on an eight-hour basis, while the remaining 1,100 complete a nine-hour day. A profit-sharing plan, based on individual records of work done, has been announced by Charles S. Ruffner, vice-president and general manager, whereunder an employee may increase his salary from five to twenty per cent. The surplus earnings of the company are being applied to this wage increase, the company having declared no other dividend over the regular six per cent.

Hearings on Electric Rates Postponed.—The Board of Public Utility Commissioners of New Jersey has postponed further hearings on the appraisal of the properties of the Public Service Electric Company, of Newark, Trenton and vicinity, with a view to establishing new rates, until January 4. Effective at that time, hearings will be held weekly until the case has been finished.

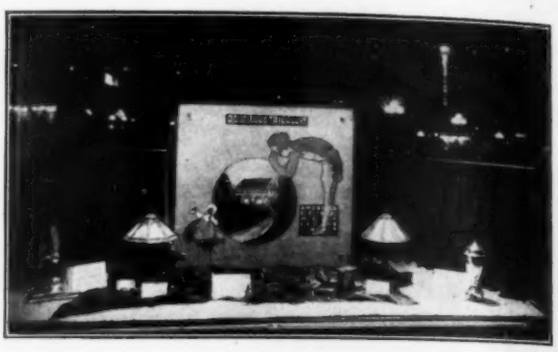
Utility Company Applies for Injunction in Order to Continue Business.—The city of Norwalk, O., which operates a municipal light and power plant, has served notice on the Cleveland & Southwestern Railway Company to remove its poles, wires and other equipment from the city within 30 days. The company holds no franchise, according to the city authorities, and its contract with the city for supplying current expired a year ago, containing a provision giving the city the right to oust it on 30 days' notice. The municipal plant was established a year ago and has since competed with the company's service. It is understood that the company is applying to the courts for an injunction against the enforcement of the city's order.

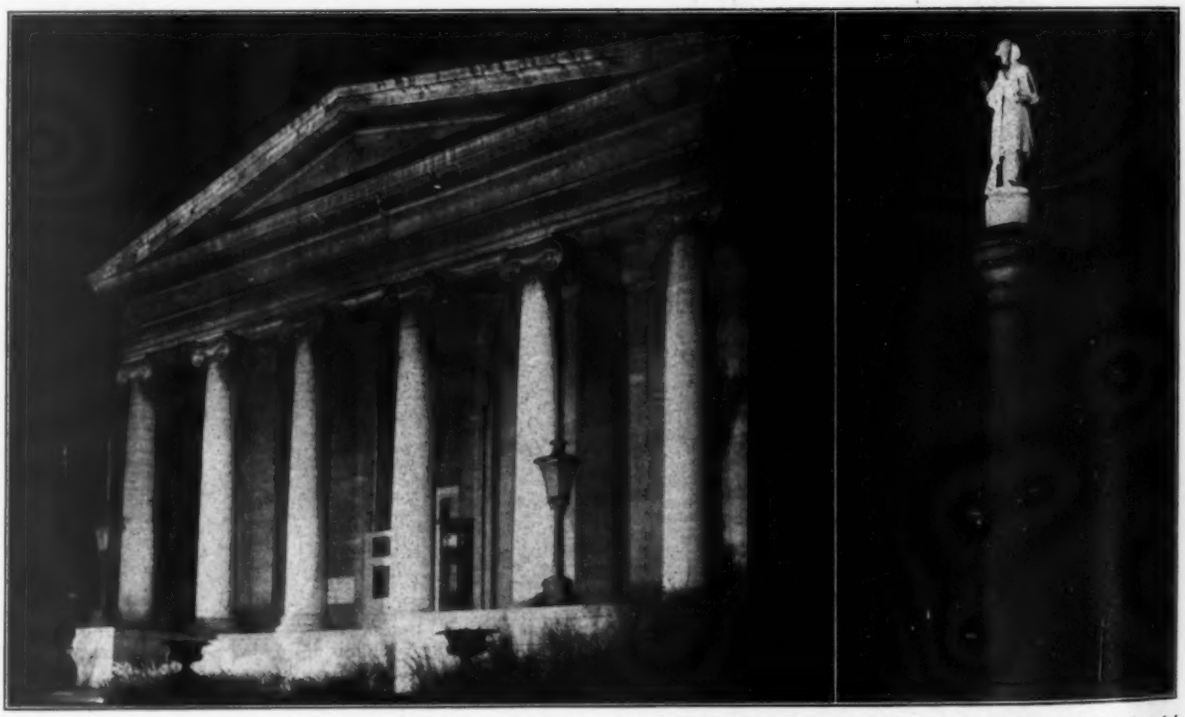
Chicago Electric Club-Jovian League Elects Officers.—The annual election of officers of the Electric Club-Jovian League of Chicago took place on Thursday, December 14, at which time the following officers were elected for the ensuing year: President, H. A. Mott; first vice-president, B. E. Blanchard; second vice-president, George H. Jones; secretary-treasurer, William H. Hodge. The new member for the Board of Trustees elected was H. A. Porter. R. I. Phillips and A. J. McGibern were members of the Board of Trustees whose term did not expire. Victor H. Tousley, retiring president, also becomes a member of the Board of Trustees. The annual entertainment of the Club will be held the evening of January 18.

Alleged Promoters of Electric and Gas Properties Indicted. Officials of Bachman & Company, investment brokers, Philadelphia, Pa., have been indicted by the federal grand jury under a charge of conspiracy. It is held that stock subscriptions were solicited in the International Gas & Electric Company, a Delaware corporation, by representing that subsidiaries, as follows, were earning sufficient profits for the International company, the holding concern, to pay six-per-cent dividends: Georgetown Railway & Light Company, Georgetown, S. C.; Syracuse Suburban Gas Company, East Syracuse, N. Y.; Concord Gas Company, Concord, N. C.; Georgetown Gas & Electric Company, Georgetown, S. C.; Newbern Gas Company, Newbern, N. C., and the Goldsboro Gas Company, of Goldsboro, N. C.

Marine Electricians to Effect Organization.—An informal meeting of marine electricians was held at Lorain, O., December 14-16. Standardization of marine electrical fixtures and the use of central-station power for ship yards and the disadvantages of the present methods of charging for energy were among the interesting subjects discussed. Visits were made to the plants of the American Ship Building Company, Lorain, O.; the Electric Controller & Manufacturing Company, Cleveland, O.; the Hickock Electrical Instrument Company, and the Pittsburgh Steamship Company's new 600-foot steamer *D. M. Clemson*, which has just been completed at the Lorain yards of the American Ship Building Company. It was decided to effect a permanent organization to be known as "The Association of Marine Electricians." The following committee was appointed for this purpose: E. L. Howarth, American Ship Building Company, Cleveland, O., chairman; A. R. Martin, Buffalo Dry Dock Company, Buffalo, N. Y.; A. B. Walton, American Ship Building Company, Lorain, O., secretary, and Frank Yager, Chicago Ship Building Company, Chicago, Ill.

Glimpses of America's Electrical Week





Dayton, O., Participated on a Very Elaborate Scale in America's Electrical Week. Herewith are Shown a Few of the Special Window Displays and the Lower Views are of Flood-Lighting Installations in Honor of the Week.

Celebrations in Various Communities

Two Views of the Electrical Exposition Held in Seattle, Wash., During America's Electrical Week. The Attendance Greatly Exceeded Expectations and All Participants Realized Handsomely on Their Expenditures.

Electrically Illuminated Float of the Nashville (Tenn.) Railway & Light Company in the "Safety First" Parade Conducted Under the Auspices of the Local Jovian League.

Electricity in Candy and Confectionery Plants

Information Regarding the Various Processes in Candy Making With Data on the Machines Involved and the Approximate Horsepower Requirements

Industrial Power Series—Article No. 186.

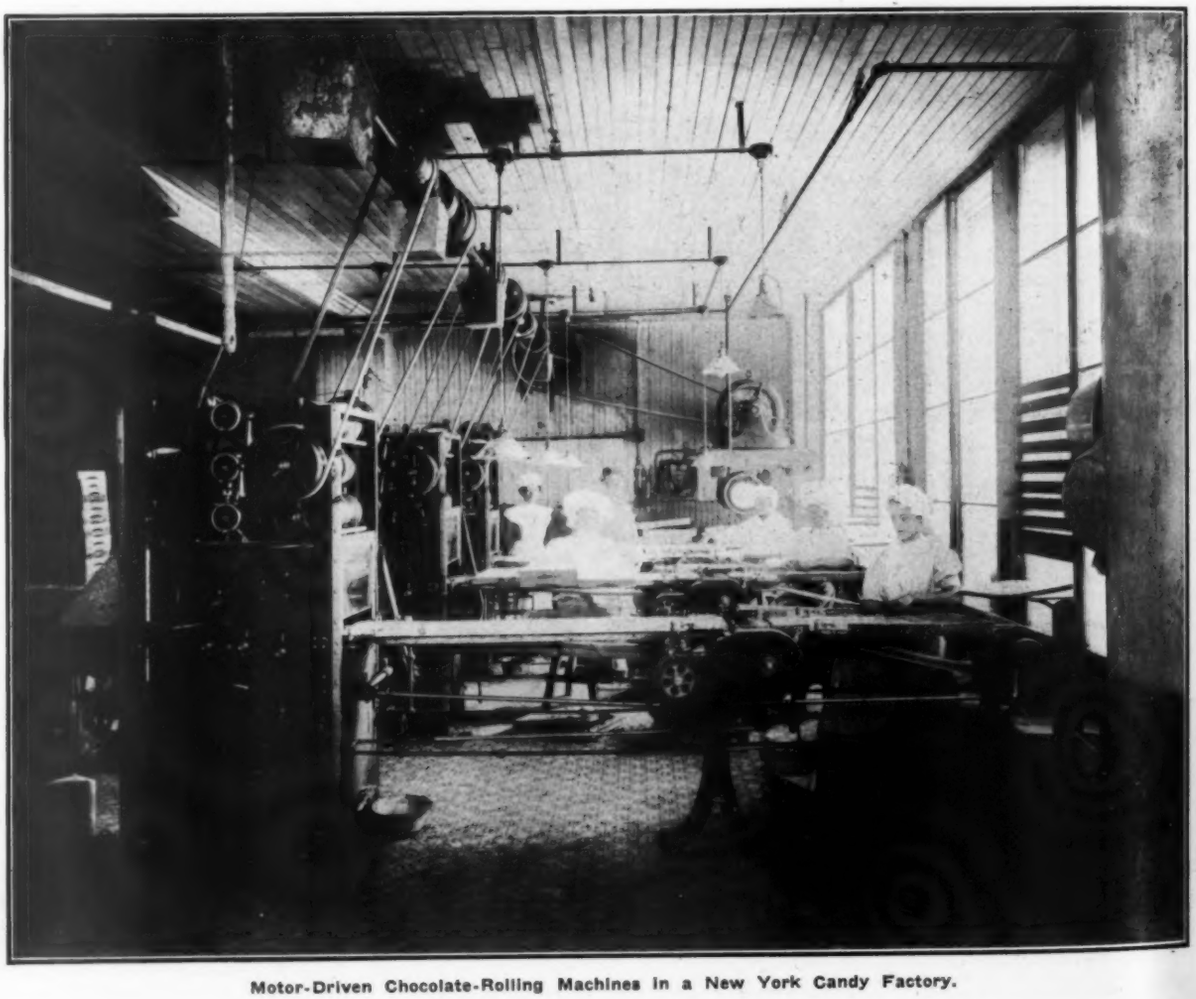
CONFECTIONERY is a term of rather vague application, but one which may be held to embrace all preparations which have sugar for their basis, or for their principal ingredient. Included under this head may be mentioned the preservation of fruits, the manufacture of jams and jellies, the art of preparing fruit syrups, in addition to the various manufacturing processes in which sugar enters as the more prominent or the principal ingredient.

The simplest form in which sugar is prepared as a sweet for eating is that of lozenges. These are simply refined sugar ground to a very fine powder mixed with dissolved gum arabic and flavored with essential oils or other ingredients. Appliances for making lozenges on a large scale and processes through which the material passes are in many respects similar to those used in biscuit baking. Loaf sugar is ground to an impalpable powder by machines after which it is mixed with dissolved gum arabic to form a stiff dough. The whole is then thoroughly incorporated in a mechanical mixer similar to a dough-mixing machine.

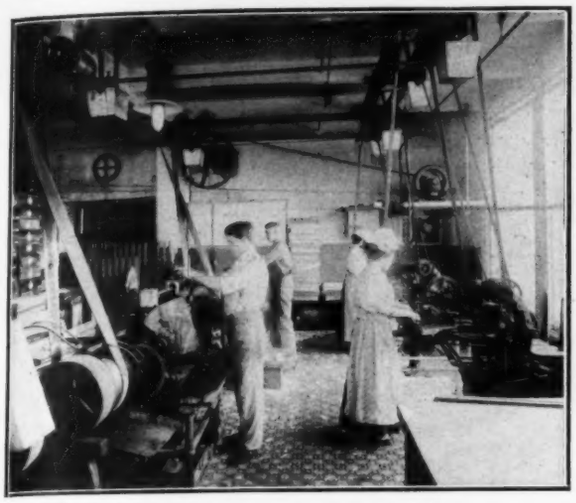
The doughy mass is then rendered homogeneous and reduced to a uniform cake by repeatedly passing it through a pair of heavy metal rollers, the surfaces being kept from adhering by the application of starch flour. The cake when sufficiently spaced out is transferred to a piece of tough web paper and passed by intermittent motion under a frame of cutters of the size and the form of the lozenges.

The cutters punch out and take up the lozenges and when the tube of the cutters is well filled the whole frame is turned over and the lozenges emptied into a tray. The scraps pass along on the web paper and are again rolled out into cakes with the paste from the mixer. Nothing more is done with the lozenges than allowing them to dry and harden on trays placed in racks in a heated compartment. Lozenges are colored and flavored with a great variety of ingredients which are added in proper proportions with dissolved gum.

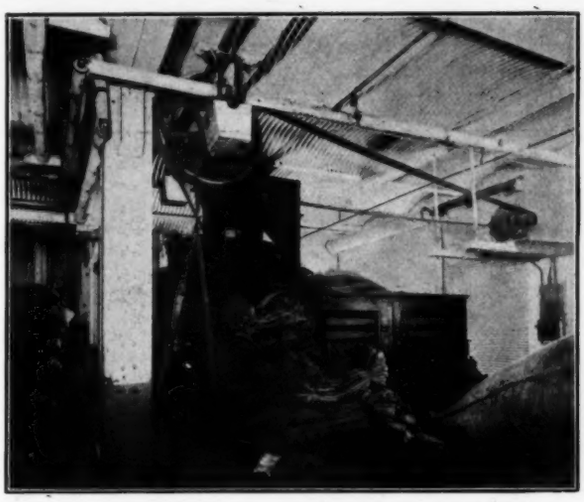
Hard confections or comfits constitute the second leading variety of confectionary. To make these a core or center of some kind is required, such as seed or fruit, or



Motor-Driven Chocolate-Rolling Machines in a New York Candy Factory.



Group of Motor-Driven Nougat Cutters.



Motor-Driven Bag-Cleaning Machine.

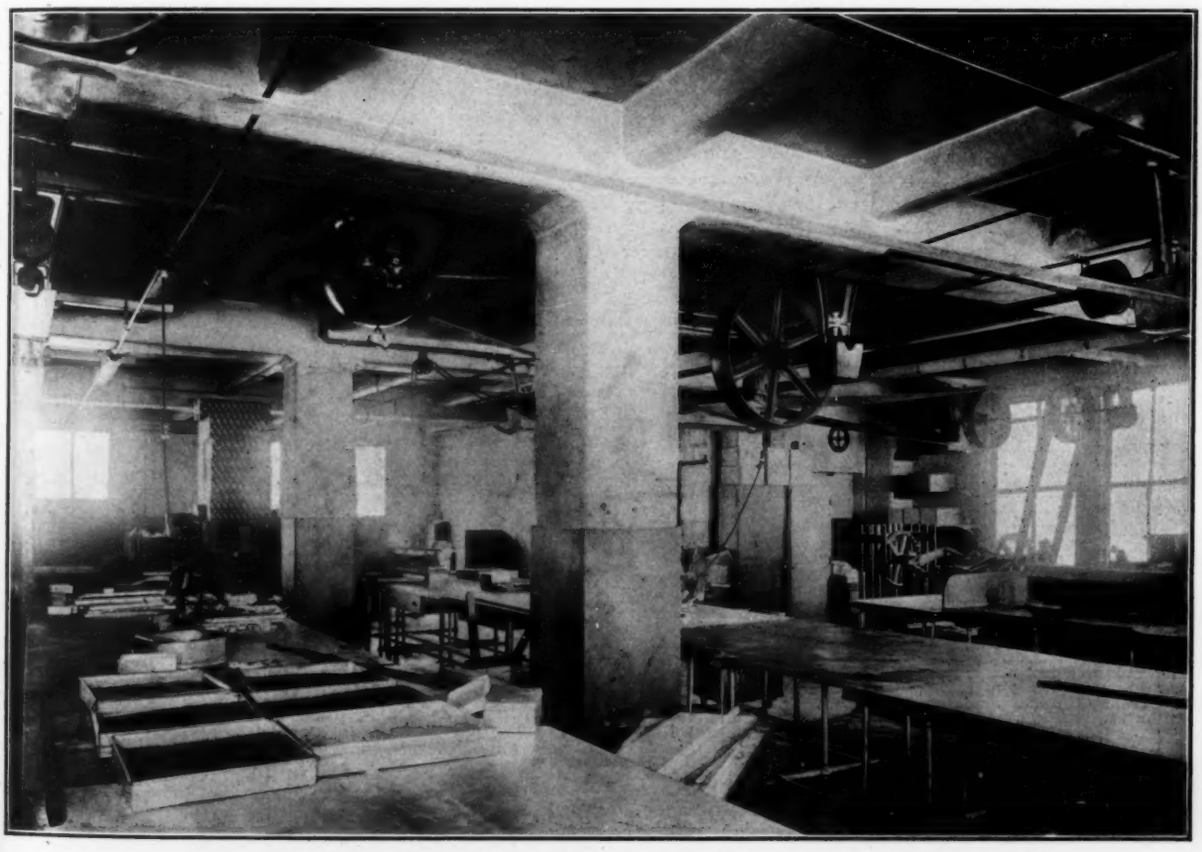
may be in the form of small lozenges as in the case of pan drops. Around such a core are deposited successive layers of sugar and there is no limit to the size which they may be made. The cores are placed in large copper vessels which are geared to revolve at an inclined angle so that the contents are kept constantly in motion. A pure strained syrup of sugar is prepared, a quantity of which is periodically applied to the contents of the pan as the contents appear to get dry. After receiving a certain coating, the comfits in process of manufacture are removed to dry and harden for some time.

The comfits thus receive alternate coatings in the pan and dryings until they attain the desired size when they are finished, by long continued friction in the pan.

Many forms of confectionery are prepared from solutions of sugar, which are boiled up to the point of crystallization. Of ordinary candy crystalized sugar may be taken as one type. It is prepared from solutions of either brown or refined sugar, to the latter of which cochineal, or some other coloring ingredients are frequently added. These solutions when boiled to a proper degree are poured into molds across which at intervals are stretched pieces of string. The sugar gradually crystalizes from its solution on the strings which are removed and the crystals dried.

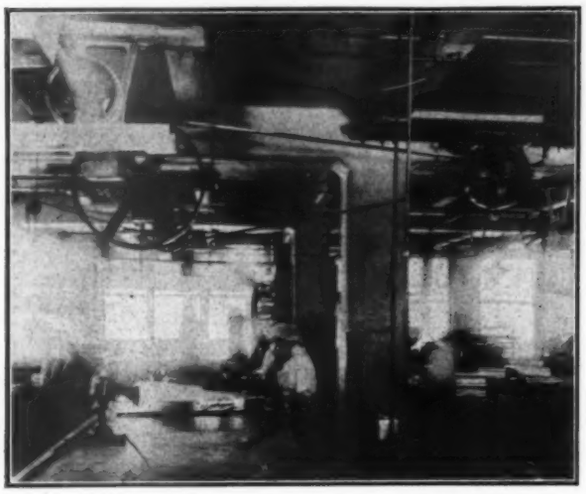
Descriptions of Some Candy Machines.

The Boston cream heating and working machine is used for working and smoothing high-grade cream and at the



Group of Small Miscellaneous Motor-Driven Candy Machines in New York Factory.

same time re-heating it to the proper temperature to cast. In operation, the arm, or smoother, takes a downward or inward motion along the side of the kettle towards its center, pulling the cream away from the sides exactly as



Motor-Driven Machines in Packing Department of a Candy Factory.

in the hand process. The copper kettle is jacketed for stem and revolves on its axis, bringing the different section of the mass of cream under the action of the smoother every time it descends. This machine is made in two capacities, 50 and 100 pounds, and is equipped with 18-by-3 and 18-by-4-inch pulleys, respectively.

The fig mixer is fitted with a copper jacketed kettle with a series of paddles or stirrers which revolve inside of the kettle. It is used for mixing fig paste and other similar ingredients. The pulley dimensions are 14-by-4 inches and the normal speed of the machine is 60 revolutions per minute.

Standard emulsifier is a mixer especially designed for the mixing of emulsions. A series of paddles or stirrers revolve in a tank and is made usually in 20 and 40-gallon sizes.

A "whip" for marshmallow or moonshine goods consists of a horizontal tank with a shaft revolving inside. Attached to the shaft are a series of wire loops. The capacity is 40 gallons and the speed 175 to 200 revolutions per minute.

In the foregoing table there is given a list of several of the more important machines used in confectionery plants with recommendations as to the size of motor needed.

POWER REQUIRED TO DRIVE MACHINERY USED IN CANDY MANUFACTURE.

Application	Horsepower
Marshmallow kettle	1
Starch buck	1
Starch cleaning machine	0.5
Jap kettle	1
Nougat mixer	1
Fig machine	0.25
Nougat cutter	0.5
Peanut roaster	0.25
Peanut husker	0.5
Cocoa-bean roaster	3
Almond crusher	0.5
Caramel sizer	3
Lozenge mixer	2
Lozenge roller	1
Lozenge dough breaker	2
Candy puller	0.5-5
Candy polisher	1.5
Candy roller	1
Candy mixer	3
Schultz sugar pulverizer	15
Sugar mixer	5
Candy rocker	0.75
Corn sheller	0.5
Sugar grinder	5
Sugar bolter	2
Mixing kettle	2
Chocolate dipper	1
Drilling cream grinder	5
Werner cream-stirring machine	2
Dilling cream-stirring machine	1-5
Depositor	0.5
Printer	0.5
No. 3 Lehman chocolate melangoer	5
Small chocolate melangoer	3
Chocolate shaking table	0.5
Chocolate mixing kettle	1
Chocolate rolling machine	5
Walters chocolate mixer	0.5
Walters chocolate-dipping machine	0.5
Holmes chocolate-coating machine	0.5

The Effect of "Summer-Time" on English Electricity Works.

The chairman of the Manchester Section of the Institution of Electrical Engineers in his inaugural address in November reviewed the operation of the Daylight Saving Act in its effect upon central stations. He said that although as a result of the operation of the act, the output from many stations had been considerably reduced, there could be no doubt whatever that from the national financial standpoint it had been an unqualified success. The general trend of opinion and the body of evidence that would be submitted to the government committee appointed to consider the matter, would, he believed, result in the retention of the act upon the statute book. Central stations devoted chiefly to lighting business and particularly those in the southern counties of England, where the day was comparatively short, as compared to that in the chief cities of Scotland, were most affected. Several of these found it necessary to raise their rates considerably without the approval of their consumers. The act had been rather aptly described as "The Artificial-Light Saving Act" by one of the engineers whose output had been rather badly affected from its dperation.

In Manchester the act had led to marked benefits to domestic users. An examination of four residential districts revealed a saving of some 15 per cent. On the other hand, in certain industrial and shopping districts a similar examination revealed an increase of some 8 per cent. In the latter case the increases were due to war work and revival of retail trading. Obviously the act had offered far less opportunity for economy in districts comprising shops closing at an early hour, than in residential districts. Its general effect on the various localities was hence governed by the character of the lighting demands in those localities.

So far as it had been possible to institute comparisons at the generating stations in Manchester it was estimated that the reduction in lighting output from the Stuart Sreet generating station for the period covered by the act was equivalent to one per cent of the total output, while the consequent saving in coal was about 600 tons. At the other Manchester municipal stations the reduction was approximately 1.25 per cent of the output, with a saving of coal of about 400 tons.

Tentative Schedule of Future A. I. E. E. Meetings Announced

The American Institute of Electrical Engineers has announced the following tentative schedule of meetings to be held the ensuing year: Pittsburgh, Pa., January 12, at which R. E. Hellmund will present a paper entitled "Regenerative Braking of Electrical Vehicles;" New York, City, Februray 7-9, midwinter convention; Chicago, Ill., March 9; Schenectady, N. Y., April 13; New York City, May 18, annual meeting.

The annual convention of the Institute will be held during the week beginning June 25, the place to be decided upon later. The Pacific Coast Convention of 1917 will be held in Los Angeles, Cal., the dates to be announced sometime later.

Electric and Steam Service for Buildings

Securing the Business of Hotels and Department Stores Depends Upon a Proper Analysis of the Electric and Steam Requirements —A Paper Presented Before the Ohio New-Business Committee

By W. P. WHITTINGTON,
Springfield (O.) Light, Heat & Power Company

HOTELS, department stores and office buildings constitute three of the most desirable adjuncts to the central-station load; especially so when considered from the standpoint of the correlated effect of the three classes upon the plant load characteristics.

Either of the three classes, when considered individually, however, possess "freaks" of load and demand character which by some are considered objectionable; the principal objection being the comparatively small numbers of hours' use of the connected load. This probably has been the predominating cause for the failure of a great many central-station companies to make rates sufficiently attractive to secure the business in these classes which are at present operating isolated plants. It would appear, upon taking a bird's eye view of the roof lines in most any of our cities and noting the comparatively few active smokestacks on the newer buildings and the predominance of them on the old buildings, that the rates for this class of business have attained that "stand-still' stage where, first, the owner of the new building feels that he is not justified in making a plant investment without first giving central-station service a fair trial, feeling that he can make the plant investment later, and makes provisions in his building for space and necessary facilities so that he can install boilers and generating equipment on the least provocation, from the serving company, or if he feels such action is warranted by a contemplated economy. In fact, a great many consulting engineers are advising that very thing today. One engineer makes the statement that he advises this procedure (in some instances when he is fully convinced that the owner can produce his own light and power and heat at a lower cost) for the reason that he will have the actual metered data relative to the operating characteristics to assist him in the design of an isolated plant.

Second, the owner of the isolated plant with his investment already made cannot be made to see the justification for discarding the equipment representing that investment without positive assurance that doing so will effect sufficient saving to justify enhanced self-esteem as regards his good business judgment.

Here are two conditions, both of which are detrimental to the central station. Under the first named it is, as a rule, comparatively easy to secure the business, but usually for short-term contracts only, which constitutes an unhealthy growth, a high service cost to the central station, and also a perpetual sales cost, as the sales department must make the same effort to renew the contract at every expiration.

The second condition is the cause of the first; purely psychological but effective nevertheless, as we cannot convince John Highbrow that he should put the thought of an isolated plant forever from his mind, when Sam Roughsketch down in the next block tells Highbrow that we haven't convinced him sufficiently to justify discontinuing the operation of that 15 or 20-year-old coal hog of his.

Of course there are many exceptions to these conditions, as is evidenced by the number of the former isolated plants which are connected to the service companies' lines today, but to prove the conditions outlined above to be the rule, just take a ride to the roof of your tallest building and look around.

It is plain to be seen that by eliminating the last named condition the first would be eliminated also.

How can this be accomplished?

First, it is essential that proper distinction be made between the building with an isolated plant and the building without this investment. Ordinarily we class them both as prospective buyers of central-station service, and such is the case; but in addition to being a prospective buyer of central-station service, the isolated plant is a competitor, the owner selling electric service to his tenants, to whom we also wish to sell service, and there is no doubt whatever but that this competitor can be eliminated and the business secured at a profitable rate if that rate be properly constructed.

All progressive authorities in rate making realize and admit the fallacy of the so-called block, or quantity rate, as it fails in every way to accomplish the ultimate objective, the "straight line on the log sheet;" neither is it equitable.

The alternative chosen by a great many is the connected or active-load basis as the determining factor of the ultimate cost per unit to the consumer, either as a basis for a fixed charge in addition to the rate per unit, as a basis for establishing a minimum charge for service or as a basis for a secondary or tertiary charge in excess of certain hours' use.

There are several objections to this method, chief of which is its tendency to restrict the expansion of the connected load in the use of heating appliances and other applications other than lighting, and even in the lighting itself, through the efforts of the consumer to reduce this fixed or minimum charge to the lowest practicable degree.

Again, the influence exerted by the connected load in buildings of this character upon the station demand cannot be determined—as can that of the small store located entirely upon the street floor where the connected load practically constitutes the maximum demand—consequently it bears no relation to the necessary plant investment.

To substantiate this contention data were requested from the companies operating in several of the principal cities of Ohio, Illinois, Indiana and Michigan, relative to the load, demand and operating characteristics of the representative hotels, department stores and office buildings connected to their lines. Out of all reports received there were but five buildings in this class where the yearly maximum demand is measured; two hotels, two department stores and one office building. The summary given on the chart herewith is illustrative of the inconsistency in the relationship of the connected load to the maximum demand.

It is not necessary to analyze the data given, as the two lower rows of figures define very clearly the point which I wish to bring out, namely, the apparent necessity for using the maximum demand as the governing factor in the calculations for rates for this class of business if we wish to secure it and retain it on a profitable basis, and at the same time compel each class to bear its own proportion of the fixed charges. How much more intelligent would our argument be to our prospect if we could say, "Mr. Highbrow, you concede your fixed charges relative to the operation of your isolated plant to be so much per kilowatt of demand, and also an additional generation cost

of so much per kilowatt-hour. Now, we can supply better service in every respect for a fixed charge of so much per kilowatt of demand per year, and an additional charge of so much per kilowatt-hour."

As owners of this class of buildings are usually business or professional men and not at all familiar with engineering analysis, it will be only when we can talk in such analogous terms as these that he will feel sufficiently confident in his own judgment to sign long-term contracts. Then the owner of the new building will not hesitate to contract for a long term of years, feeling that if the other fellow can afford to throw away an investment already made, he is perfectly safe with no investment made.

Referring again to the chart, I should like to ask how many industrial power consumers have we along our lines today to whom we are making the greatest inducements and spending the most money to secure, who are using their maximum demand nine hours per day, 365 days, or 300 days, or even 200 days, per year. Furthermore, the larger industrial power users are, as a rule, located in the outlying districts with the consequent high plant investment and distribution costs, while the hotels, department stores and office buildings are usually situated in that district where the highest proportionate plant investment is already made in underground construction and over capacity, and where we should put forth the greatest inducements to secure all available, profitable business conducive to complete saturation.

Steam Heating.

The steam-heating business has just passed that period experienced by the electrical utilities some years ago when investors were skeptical as to the stability of the business and, in some cases, lacked sufficient confidence in the management to entrust funds to them.

The cause of this black eye, as it might be called, was, as in the case of the electric utilities, due to the lack of judgment or experience in the proper consideration of those peculiar conditions which are so far reaching in their effect upon the successful operation. Consequently there have been many failures.

These features are gradually being eliminated by company co-operation through the medium of the various associations, chief of which is the National District Heating Association, to which is due great credit for the progress made in the industry during the past five years.

One of the conditions peculiar to the heating business is the high initial investment required for the proper installation of a system of mains, and as the system in the Middle West will operate but seven and in some localities eight months per year, and as the revenue during the first and last months of the heating period is very low, the yearly fixed charges must be overcome during a period of six months' operation.

If a system of electrical distribution is underloaded, distribution losses are low in proportion. Not so, however, in a system of steam mains; if they are over-sized (which they usually are in an up-to-date plant, to provide for future business), in addition to the excessive fixed charges due to investment in the over capacity, there is a perpetual operating loss due to that over capacity, as the distribution losses are practically the same as though the system were loaded to capacity. Under these circumstances, it would seem essential that we load these mains to capacity as quickly as possible, providing, however, we have the steam to sell. Unfortunately some companies are afflicted with such low rates along with unfavorable plant conditions that expansion would not be justified until more favorable rates can be obtained, but if we are so fortunate as to obtain profitable rates for steam, what is to prevent us selling steam to the limit, whether it be live steam or exhaust steam?

Naturally our first efforts are towards securing the hotels, department stores and office buildings, as they are usually the larger buildings along the lines. This class of business is desirable for two reasons; first, on account of the large quantities of steam used; second, the cost to serve is low, it being necessary to maintain but one meter and service, whereas to secure the equivalent volume of business in any other class it would be necessary to maintain at least five or six service installations.

The uses of steam in hotels, department stores and office buildings is varied; heating, water heating, laundry use and steam cooking are the principal requirements.

There seems to be a great difference of opinion among consulting engineers as to the most efficient systems of steam heating for this class of business, some favoring vacuum systems and others claiming superiority for the vapor type. Personally, I believe if they would take into consideration the source of service supply they would be compelled, from the standpoint of economy and close regulation, to decide upon the vapor installation where service is supplied from central-station mains.

In Springfield, O., there have been adopted two of the well known vapor systems, which are recommended for buildings of this kind. The two systems are applicable to widely varying conditions. In some places we recommend the use of one type and in others the other type, dependent upon the condition under which it is to operate.

The heat leakage of a vacuum system is no less than 15 per cent, while with a properly constructed vapor system the leakage is from 3 to 5 per cent, dependent upon the regulation. Under these conditions, it can be readily seen that where the condensation goes to the sewer, the heat leakage of the vacuum is an actual loss. There is no doubt, however, but that vacuum systems are a thing of the past in the central-station field, for, as one writer puts it, "a push is as good as a pull," consequently where we maintain sufficient pressure on our lines to "push" the air out and give adequate circulation, we recommend operation as a straight steam system.

The data relative to the steam-heating operation are given for the buildings in the accompanying table. Department store No. 1 consists of two separate buildings. In one is installed a down-feed, single-pipe system, condensing 764 pounds per square foot per season. In the other is an atmospheric system condensing 474 pounds per square foot per season. These figures are based on required straight steam radiation calculated from the heat loss, due allowance being made for the excess radiation necessary with an atmospheric system, so that the comparison is direct. The vacuum systems on our lines show the efficiency in operation as being just between the figures given above, or from 600 to 650 pounds per square foot required radiation per season.

The required radiation for three of the buildings in the table is not given, but there is sufficient information shown to demonstrate the unreliability of co-operative data based on contents and radiation connected. Consequently, it has not been attempted to give any data relative to the heating of the various classes of buildings for co-operative use. In fact, such information is misleading unless the same rule and values are used to calculate the required radiation for the prospective building, as was used for the building from which the data are taken. This is particularly true of the older buildings, as it is but very recently that steam heating has been scientifically applied, the various old rule-o'-thumb methods having been used in calculating the requirements in most cases. The majority of these old rules do not take into consideration the class and quality of construction, two of the most important factors to be considered in the heat loss, consequently there is a great variance in the radiation installed when compared to that calculated from the heat loss and air changes. There is no doubt but that it will be necessary for central-

station companies who are interested in the steam-heating business to adopt some reliable rule as standard for calculating radiation required before true co-operation can be obtained in this field. One of the great opportunities for expansion of the central-station steam business is in low-pressure steam cooking. Considerable progress has been made in the past two years along this line, pioneer work being done by the educational committee of the National District Heating Association, which has obtained some very satisfactory results.

On two pounds steam pressure there should be no difficulty in operating dish warmers, steam tables, dish-washing machines and hot-water and beverage urns. The latter necessarily should be of the gravity-discharge type in order to secure the desired temperature in the shortest period of time. Compartment vegetable steamers which until very recently required from 25 to 30 pounds pressure, can now be successfully operated with less than one pound, returning the condensate to return lines or condensation trap and meter.

The steam meat roaster and the steam kettle in their present form cannot be considered as satisfactory, although fair results may be obtained by using a fully jacketed kettle of 50 per cent greater capacity than required, and well insulated. In the opinion of some, the solution of the kettle problem is a corrugated inner surface. thus increasing the conducting surface between the steam and the liquid in proportion to the capacity of the vessel. I believe, however, that it will be necessary to alter the design of the kettle as at present used, to one with a cover arranged to contain steam also, acting as additional heating surface rather than an exposed surface with the accompanying losses. As the cover represents a considerable portion of the total surface of the kettle, there is no question but that this factor must be considered before a maximum result is obtained.

The principal requirement in the successful operation of a low-pressure steam kitchen is the complete elimination of air from piping and apparatus, and free circulation, the fixtures being installed similarly to a radiator to be operated at atmospheric pressure with an individual radiator expansion trap on the fixture and a dry return vented to atmosphere. This will give much better results than a common return, providing the traps are properly taken care of.

The low-pressure steam cooking business is worthy of the serious consideration and intensive exploitation of all companies which have exhaust steam to sell, as it is the one solution in making the heating load curve consistent with the electric load curve. The maximum cooking load comes at that time of the day when the heating load is down and the electric load the heaviest with the consequent increased available steam, and conversely, the lightest cooking load would be at an early hour in the morning when the heating load is heaviest.

Naturally the question arises, "What inducement can we make to this class of business to enable us to secure a sufficient number of summer consumers to justify summer operation?" To those companies who are now receiving adequate rates for steam, I would say that a lower rate is not necessary, but a reconstruction of that rate, such as a fixed charge per square foot of radiation required for all purposes, with an additional charge per thousand pounds for metered steam.

Then the yearly steam consumer would automatically earn a lower average rate per thousand pounds in proportion to his time use of the required radiation, just as is the average rate per kilowatt-hour lowered in proportion to the hours' use of the maximum demand in properly constructed electric rates today.

This plan might also enable those companies who are receiving unprofitable rates to increase the average revenue per thousand pounds, increase the yearly revenue, and at the same time reduce the proportionate monthly fixed charges through 12 months' operation. However, local conditions govern the possibilities almost entirely and of course would have to be given full consideration in any contemplated change.

Nitrogen Company Makes Contract for Power.

The American Nitrogen Products Company, of Seattle, Wash., has entered into a contract with Tacoma authorities for the necessary energy from the municipal power plant of that city to operate the first unit of a nitrates plant the company will erect at La Grande, Wash. The plant is to cost about $500,000. Work has already started on the erection of furnaces and it is expected that it will be completed in about one year, but a portion of the plant will be in operation to a limited extent within the next few months.

The main development will probably be made in Snohomish County, 50 miles north of Everett, where the company is interested in a power site on the Sauk-Suiattle River, where it is estimated that approximately 200,000 horsepower can be developed. The city of Seattle, however, has been for some time interested in this site and is giving it consideration with a view to enlarging its municipal plant. The city engineer of Seattle and other prominent engineers acquainted with the site have advised against its use by the city on the ground of the great expense that would attend its development. It is quite likely that it will be abandoned as a city project.

The president of the nitrogen company recently returned from a trip to Norway, where he made a critical study of the great nitrogen plants of that country. A number of experts from Norway were brought back to assist in developing the La Grande works and extensions. Patents in 10 countries are held on the Wielgolaski system for the fixation of nitrogen.

The plans of the company contemplate the expenditure of expenditure of $50,000,000.
$20,000,000 for power development alone, with an ultimate

DATA ON HOTELS, DEPARTMENT STORES AND OFFICE BUILDINGS USING ELECTRIC AND STEAM SERVICE SUPPLIED BY CENTRAL STATIONS.

ELECTRIC SERVICE.	Hotels		Department Stores		Office Buildings	
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
Connected load in light, kilowatts	68	53	184	100	9	20
Connected load in power, kilowatts	51	61	238	146	75	69
Yearly kilowatt-hour consumption (light)	160,424	Combined	413,467	380,343	10,755	46,127
Yearly kilowatt-hour consumption (power)	177,720	89,987	119,308	63,090	63,690	38,103
Yearly maximum demand	78	25.3	238	120	?	35
Hours' use per day of connected load	7.79	2.16	5.45	4.93	2.43	2.59
Hours' use per day of maximum demand	11.88	9.76	6.13	10.11	.....	6.60
Number of rooms	222	127	.....	.....	152	137
Number of floors	9	5	7	5	10	12
Cubical contents	941,957	1,276,710	2,176,105	1,795,200	455,490	1,276,710
STEAM SERVICE.						
Kind of System	Vapor	Vacuum	Vapor and Single Pipe	Indirect and Single Pipe	Vapor	Vacuum
Square feet direct radiation installed	10,958	6,738	16,133	13,998	6,918	4,760
Square feet direct radiation required	12,390	?	18,656	?	7,166	?
Low-pressure steam consumption (pounds)	8,565,000	6,730,000	11,745,000	18,372,000	4,142,000	3,058,000
Pounds per square foot radiation installed	781	970	727	1,312	598	642
Pounds per square foot radiation required	691	?	629	?	576	?
Pounds per square foot of contents	8.9	5.27	5.4	10.2	9.	2.4
Steam consumption, water heating (pounds)	2,952,000	1,250,000	.....	.....	.....	.....

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

MOTOR-CAR ILLUSIONS.

Some Comparisons Between the Electric and Gasoline Passenger Car Which Can Be Used by Central-Station Salesmen.

By Gail Reed.

How often we have heard the expression "I never thought of that!" How often have we individually repeated this to ourselves, and in analyzing its cause invariably find our failure to exercise common sense responsible.

While applying the subject of illusions in this particular instance to the motor car, it will give us much on which to ponder, if we give but a fleeting glance to the cost of our illusions.

Taking up our motor-car illusions in their sequence: We first bought automobiles as a sort of gamble, or, not to use quite so pointed a term, our sporting instinct alone prompted the purchase. The thought that the motor car was a 'practical investment never entered the transaction. We decided on a new toy, and for several years obtained the light pleasure that comes from the extravagant plaything.

The rapid development in construction extended the field beyond that of the toy, and for the money invested in motor cars, there was obtained a better percentage of real utility, but another illusion again walked in—this time clothed as "speed mania"—a car must be had that would do not less than 60 or 70 miles an hour, the faster the better, and for some time this illusion held the reins with a tight grip.

Terrific wear and tear, great expense in car repairs and heavy toll in lives finally broke the costly speed mania.

The next stage showed the development of the motor car along saner lines—excessive high speed gave way to moderate speed, sounder general construction and improvements tending to reduce the high cost of operation. Sales were now running into large commercial figures, the gasoline motor car was being hailed as the universal solution for light transportation—illusions fathered thousands of sales—the illusion of the majority being, here is a perfected means of transit for my entire family—there is no limit to our travel horizon—away to the mountains, the sea, the woodlands.

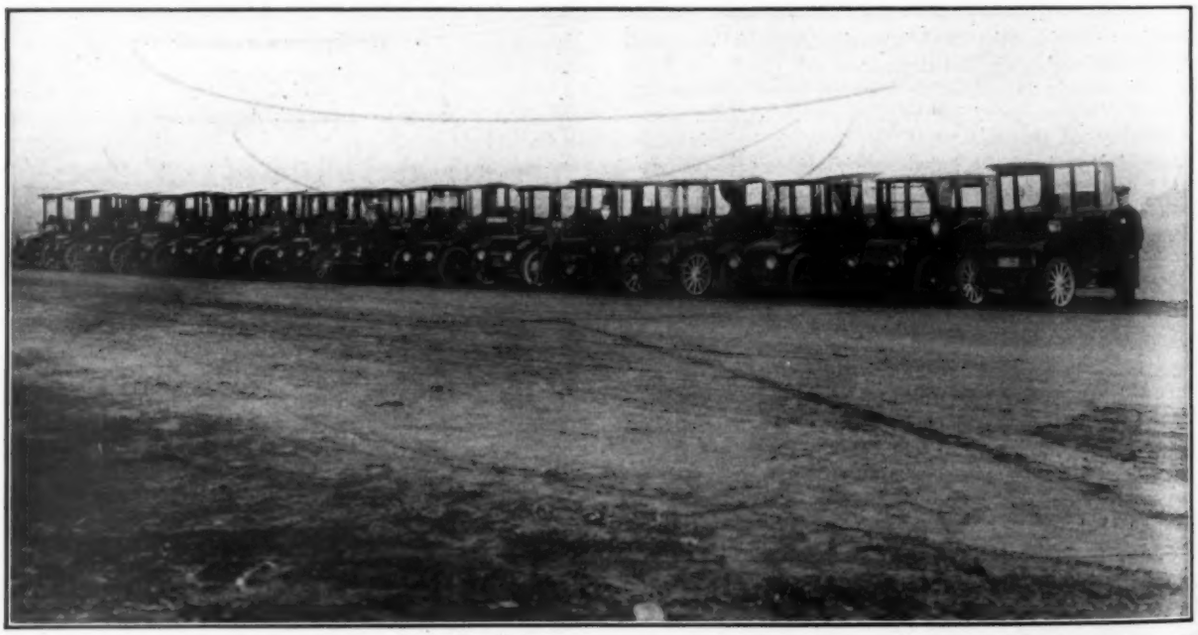
Deficiencies in motors for country travel, the dangers of starting through cranking, the necessity of skilled mechanical aid to overcome the many failings under road service, soon taught its lesson and the touring illusion was rapidly and radically reduced.

The last stage of the development of the gasoline motor car brings us to the present phase of this industry, which qualifies in no indecisive manner the true status of the automobile.

The development of the self-starter, electric light systems and many other points of construction have given the mechanism wonderful perfection compared with the gasoline propelled vehicle of a few years ago, and judged solely from a technical standpoint, the up-to-date gas car is a wonder of ingenuity and skill.

With each successive development has come a truer knowledge on the public's part of what constitutes real motor service. Illusion after illusion has given way to practical reasoning.

These different stages have developed the fact that touring requirements are confined almost entirely to rural dis-



Group of Electric Vehicles Parked in Grant Park, Chicago, Under Auspices of Chicago Section, Electric Vehicle Association. This Service Is Free to All Chicago Owners. The Association Drives Cars to the Park and Returns Them to Stations at Order of the Owners.

tricts. Those living in city and suburban districts have found touring an illusion. This statement is found to truthfully apply to 98 per cent of city residents.

While the gasoline automobile is fresh in an owner's hands, several tours are made—none too good roads are encountered, the days on which the entire family can go are the week ends when all other motorists attempt to take the road—consequently the dream of pure country air is polluted by a thousand other gasoline-burning, dust-provoking automobiles. Pictures of rural beauties and roadside picnics are held in mind, which turn out to be mere illusions. After the first few attempts at country touring, the owner confines his driving to the broad boulevards, the lakeside drives and the cool, green parks—where a drive of a few blocks will reach hostelries where the most appetizing dinners can be served minus a mixture of dust, oil and smoke.

The Illusion of the Private Chauffeur.

Another illusion under which many purchasers of cars labored is the advantage of having a private chauffeur. Without consideration to the very high cost of such an individual, this illusion is undergoing dissipation through the many shortcomings of a chauffeur in nine cases out of ten. Instead of being independent to go and come whenever it pleases, the use of the car hinges on the chauffeur's disposition. Anyone of a thousand excuses, supported by the numerous ills of a gas engine, will prevent the use of the car, probably when needed most. Even though fortunate enough to have an ideal chauffeur, in order to keep the car in constant adjustment and proper running order, it is not fair to work him day and night; in fact, he cannot stand it, and most car owners dependent on chauffeurs lose the entire freedom of their car on this account.

Looking at this chauffeur proposition from an economic standpoint, several electrics could be maintained on the money paid for one year's salary.

In this connection another illusion, applying particularly to Chicago and other large cities, is the thought that people must have a driver to take care of their cars while in the congested downtown districts, and figure that as they must have a driver at any rate, they might as well buy a gasoline car. On account of this illusion alone, they will purchase an automobile very costly to maintain, and, in addition, take on the heavy expense of a chauffeur, admitting at the same time that for all other purposes they would prefer the independence of driving their own car.

This problem is but an illusion, for the progressive steps taken by electric-vehicle interests have established in Chicago conveniently located parking service stations. The electric is driven to this station where it is cared for until the owner returns. This service adequately meets this big problem and does not cost the owner one cent.

The public today is judging motor-car values by utility, economy and efficiency standards. The factor that has broken down illusions and established the true status of the motor car is the electric passenger car.

Electric Car Breaks Down Illusions.

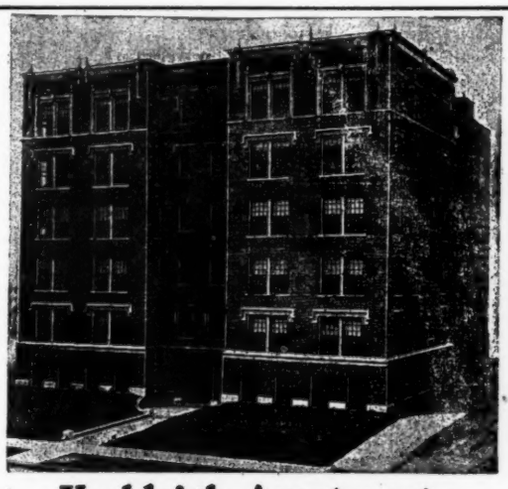
The electric passenger car has been responsible to a large degree for the engineering triumphs of today in all types of motor-driven vehicles. The electric has set the standard in closed body construction; has been and remains pre-eminent in simplicity and safety of control, which have been responsible for the self-starter, improved gear shifts, left-hand controls and the numerous other improvements adopted for gas cars in the attempt to equal the electric. The electric vehicle has offered the standard by which all these developments are measured. The most important advance of the gas-driven cars has been due to electric car development—current starts the motor, supplies the life spark, lights the car, and in the later models controls the speeds.

The development of the multi-cylinder gas car can be traced directly to the electric through the attempt of engineers to furnish a power plant and control that approaches the electric ideal in flexibility and velvet smoothness.

Wherever the modern electric has made its presence felt, motor-car illusions have been broken down and in their place the public has gained its first true knowledge of motor-car utility and economy. So far as the modern electric automobile spreads its influence, just that soon will the electric standard of motor car travel be established throughout the country.

Union Company Making Progress in Its Electric-Range Campaign.

That the Union Electric Light & Power Company, of St. Louis, Mo., is making commendable progress in its electric-range campaign is indicated by the accompanying reproduction of an advertisement which was recently published in the St. Louis papers. As stated in the copy, this installation comprises 36 ranges, and is one of a number of similar installations recently made.



Yorkleigh Apartments

4954 West Pine Boulevard

36 Perfectly Appointed Apartments with an

Electric Range

IN EVERY KITCHEN

No modern home is complete without an Electric Range.

Economical—Sanitary—Safe
Modern Convenience—Better Results

Ask us to tell you what the Electric Range means to the busy woman of today.

Bell, Main 3220 Kinloch, Central 3530

UNION ELECTRIC Light & Power Company

MEMBER ADVERTISING CLUB OF ST. LOUIS

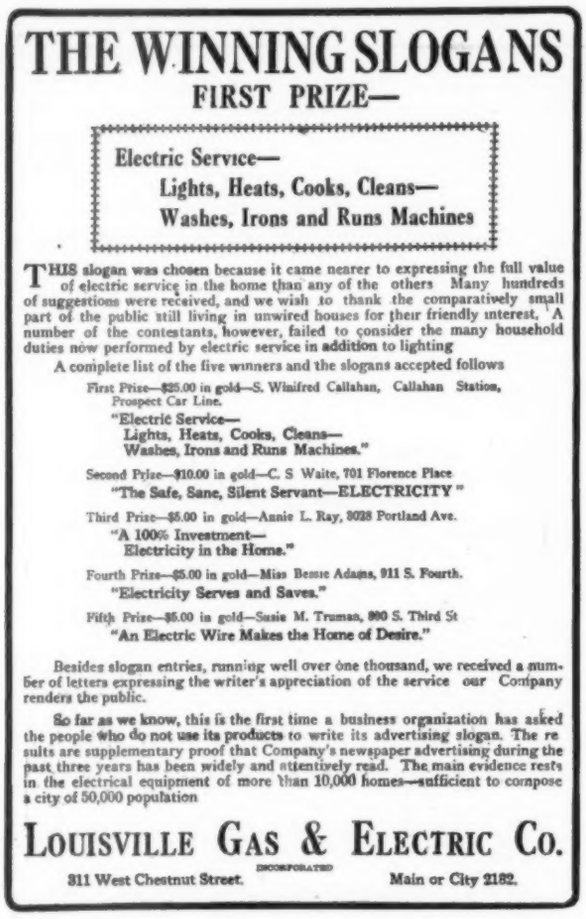
Advertisement of St. Louis Company Indicating Its Success In Installing Electric Ranges in Apartment Buildings.

In a measure, the greatest field for the sale of electric cooking in the larger cities lies in apartment buildings, and the campaign in St. Louis is typical of the activities in a number of cities.

LOUISVILLE SLOGAN CONTEST ENDS.

Non-Users of Electricity Asked to Suggest Phrase Stating Advantages of Electricity.

An interesting slogan contest, out of the ordinary in the object sought, has just been completed by the Louisville



THE WINNING SLOGANS

FIRST PRIZE—

Electric Service—
Lights, Heats, Cooks, Cleans—
Washes, Irons and Runs Machines

THIS slogan was chosen because it came nearer to expressing the full value of electric service in the home than any of the others Many hundreds of suggestions were received, and we wish to thank the comparatively small part of the public still living in unwired houses for their friendly interest. A number of the contestants, however, failed to consider the many household duties now performed by electric service in addition to lighting

A complete list of the five winners and the slogans accepted follows

First Prize—$25.00 in gold—S. Winifred Callahan, Callahan Station, Prospect Car Line.
"Electric Service—
Lights, Heats, Cooks, Cleans—
Washes, Irons and Runs Machines."

Second Prize—$10.00 in gold—C. S Waite, 701 Florence Place
"The Safe, Sane, Silent Servant—ELECTRICITY"

Third Prize—$5.00 in gold—Annie L. Ray, 3028 Portland Ave.
"A 100% Investment—
Electricity in the Home."

Fourth Prize—$5.00 in gold—Miss Bessie Adams, 911 S. Fourth.
"Electricity Serves and Saves."

Fifth Prize—$5.00 in gold—Susie M. Truman, 800 S. Third St
"An Electric Wire Makes the Home of Desire."

Besides slogan entries, running well over one thousand, we received a number of letters expressing the writer's appreciation of the service our Company renders the public.

So far as we know, this is the first time a business organization has asked the people who do not use its products to write its advertising slogan. The results are supplementary proof that Company's newspaper advertising during the past three years has been widely and attentively read. The main evidence rests in the electrical equipment of more than 10,000 homes—sufficient to compose a city of 50,000 population

LOUISVILLE GAS & ELECTRIC CO.
INCORPORATED

311 West Chestnut Street. Main or City 2182.

Louisville Company's Advertisement Announcing Prize Awards in Slogan Contest.

(Ky.) Gas & Electric Company. The slogan, of course, was to state in a catchy form the advantages of electric service, but, instead of calling on subscribers to the company's service the advertisement announcing the contest stated that contestants to be eligible must be residents in non-wired houses. According to Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, this is the first time, so far as ascertainable, that a company has asked people who do not use its product to compete in a slogan contest. The reason in this case is obvious—to interest non-users in the service. More than a thousand answers were received, besides numbers of letters from other people expressing appreciation of the service given. Five cash prizes were given, the first prize of $25, the second $10 and the three remaining of $5 each. Besides that, the advertising-copy writer for the company has a good many crisp phrases which he will be able to make good use of. The winning slogans, which are reproduced here, failed to develop anything particularly noteworthy, although several of them are of special interest.

First prize: "Electric Service—Lights, Heats, Cooks, Cleans—Washes, Irons and Runs Machines."

Second prize: "The Safe, Sane, Silent Servant—Electricity."

Third prize: "A 100-Per-Cent Investment—Electricity in the Home."

Fourth prize: "Electricity Serves and Saves."

Fifth prize: "An Electric Wire Makes the Home of Desire."

The accompanying illustration shows an advertisement published by the company announcing the prize winners.

Successful Electric-Sign Campaign Held in Dayton.

In anticipation of America's Electrical Week and with the idea of having the maximum amount of illumination on the streets at that time, the Dayton Power & Light Company conducted during the month of November an electric sign campaign, and as a special inducement offered the first set of lamps free to purchasers of electric signs, if they would execute a two-year flat-rate contract.

The campaign resulted in 30 contracts being secured, covering 4,659 7.5-watt lamps, or their equivalent, which means adding $3,153.60 to the gross yearly revenue of the company.

The first big event of America's Electrical Week was the turning on at 5 o'clock Saturday afternoon of the units to flood-light the main entrance of Dayton's old court house, which is an old land mark of Grecian architecture.

The lighting was accomplished by four 500-watt flood-lighting lamps, and has made a wonderful impression on the people of Dayton.

At the same hour a flood-lighting unit "flood-lighted" the soldier on top of the Soldiers' Monument, located at the corner of Main Street and Monument Avenue, which has also met with the approval of the citizens. Views of both of these installations are shown elsewhere in this issue.

INTERESTING STATISTICS ON ELECTRIC COOKING IN BOSTON.

Aggregate Saving to Range Customers Because of Economies Many Thousand Dollars.

Some interesting statistics regarding the conveniencies and economies of electric cooking have been prepared by the Edison Electric Illuminating Company, of Boston, and are made the basis of a letter which is being sent to housewives in the Greater Boston territory.

It is pointed out that modern housekeeping methods are today saving many steps for the housewife. These methods are not only saving steps which cost money, time and strength, but they are also reducing food wastes, cutting down coal consumption, and by doing away with the dirt and smoke, bringing about a great saving in furniture and housekeeping expenses.

Who would believe, for example, that enough people in Greater Boston are using the modern method of cooking by electricity so that their saving on meat shrinkage alone may amount to $84,943.75 in one year? Who would believe that this same group of people, by eliminating the use of coal, may be saving on that one item alone, $48,450 a year? That they may be saving $2,280 a year by not having to have their ash cans lugged out to the sidewalk every week; that the total saving in steps for these families amounts to 7,524.95 miles in a year; and that this saving in steps is just the same as saving for one person out of the group a walk from New York to San Francisco and back?

These wonderful possibilities in saving figure out as follows:

At the present time there are 950 electric ranges in use in the territory in Greater Boston served by the Boston Edison Company. Assuming that the average family includes six persons there are, therefore, 5,700 persons in this territory living by the electric way.

The average daily meat consumption per person may safely be assumed at one-half pound, or 2,850 pounds for the whole group of people. The average shrinkage in preparing meat on the old-fashioned range is 35 per cent. The average

shrinkage in electric cooking is only 10 per cent. This means that the average saving by electric cooking is 23 per cent. or 665 pounds per day, for this group of people. This, at an average price of 35 cents per pound, equals $232.75 per day, or, if these people use their electric ranges all the year around, an astounding total of $84,943.75 per year.

The average coal consumption per family is one-half ton. or 1,000 pounds per month. This equals six tons per year, and for 950 families equals 5,700 tons (a ton per person per year) at an average price of $8.50 per ton for nut coal, which equals for the year's saving by cutting out the coal, $48,450.

Estimates place the cost of electricity for cooking at $4 per month per family—an average of six in each family. With 5,700 persons in this group, and electric cooking assumed for all the year around use, the total expenditure for electric cooking may be figured at $45,600.

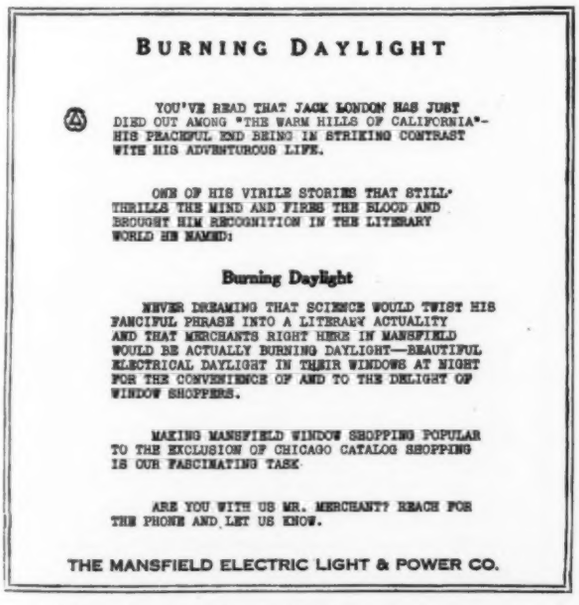
Reliable estimates allow 400 pounds of ashes and cinders to the ton of range coal. This large percentage of waste is, of course, due to carelessness in running the fire and to imperfect combustion. In the 5,700 tons of coal there are, therefore, 2,280,000 pounds of ashes and cinders, which must be delivered at the curb in cans and carted away. The usual charge of ten cents per can of about 100 pounds makes a saving for these people, if they use their electric ranges all the year around, of $2,280 per year.

To sum up these interesting deductions, we have, therefore:

Saving on meat shrinkage per year	$ 84,943.75
Saving on coal per year	48,450.00
Saving on handling ashes	2,280.00
	$135,673.75
Cost of electricity, if used all the year around by 950 families for cooking	45,600.00
Saving over coal by this modern method	$ 90,073.75

Mansfield Company Using Effective Advertising Copy.

In seeking to focus the public's attention on the product it is selling the Mansfield (O.) Electric Light & Power Company has been running daily advertisements in the Mansfield newspapers. Effective copy made the series of advertisements on electric power net good results, and in



BURNING DAYLIGHT

YOU'VE READ THAT JACK LONDON HAS JUST DIED OUT AMONG "THE WARM HILLS OF CALIFORNIA"- HIS PEACEFUL END BEING IN STRIKING CONTRAST WITH HIS ADVENTUROUS LIFE.

ONE OF HIS VIRILE STORIES THAT STILL THRILLS THE MIND AND FIRES THE BLOOD AND BROUGHT HIM RECOGNITION IN THE LITERARY WORLD HE NAMED:

Burning Daylight

NEVER DREAMING THAT SCIENCE WOULD TWIST HIS FANCIFUL PHRASE INTO A LITERARY ACTUALITY AND THAT MERCHANTS RIGHT HERE IN MANSFIELD WOULD BE ACTUALLY BURNING DAYLIGHT—BEAUTIFUL ELECTRICAL DAYLIGHT IN THEIR WINDOWS AT NIGHT FOR THE CONVENIENCE OF AND TO THE DELIGHT OF WINDOW SHOPPERS.

MAKING MANSFIELD WINDOW SHOPPING POPULAR TO THE EXCLUSION OF CHICAGO CATALOG SHOPPING IS OUR FASCINATING TASK

ARE YOU WITH US MR. MERCHANT? REACH FOR THE PHONE AND LET US KNOW.

THE MANSFIELD ELECTRIC LIGHT & POWER CO.

Noteworthy Advertisement of Mansfield Company.

turn the Daylight lamp is getting its share of publicity. One of the advertisements as to the merits of this lamp is especially good and is reproduced herewith.

Essay Contest for Popularizing the Electric Iron in Hot Springs.

Although the electric iron is perhaps the most widely used electric appliance among the household devices, still there are very few, if any, localities where the saturation point has been reached. The Citizens Electric Company,

"The Advantages of An Electric Iron to Mother"

Miss Florine Horn, High 6th Grade, Ramble School

Wins Junior Electric Range for Best Essay. Offered by the CITIZENS ELECTRIC COMPANY.

BEST ESSAY | SECOND BEST | THIRD BEST | FOURTH BEST | FIFTH BEST

The Essays of the Following Pupils Are Worthy of Honorable Mention:

Miss Phyllis North, Central School. Miss Thelma Scarborough, Ramble School.
Miss Opal Forsythe, Central School. Miss Beatrice Schenoff, Oaklawn School.
Miss Bernice Boulah, Oaklawn School. Miss Lillian Fisher, Ramble School.
Miss Frances Ober, Ramble School. Miss Nora Lea Irvin, Garland School.

Many other essays of considerable merit were among the large number submitted to us, but limited space forbids printing them. We wish to commend the Hot Springs Schools on the general high order of all Essays.

JUDGES:

Mr. W. Kleinschmidt, Electric Supply Co. Memphis, Tenn. — Mr. R. P. Bowles, Jr. Westinghouse Lamp Co. Memphis, Tenn. — Mr. Don Cameron, Western Electric Co. Little Rock, Arkansas

Popularizing the Electric Iron in Hot Springs.

of Hot Springs, Ark., had this thought in view when it conducted a prize essay contest on "The Advantages of the Electric Iron to Mother."

This contest was held in conjunction with America's Electrical Week and was entered into by school girls from the third to sixth grade, inclusive. The essays were a part of their English studies at school and were written on a certain day in the presence of the teachers.

In commenting on the contest, S. E. Dillon, general manager of the company, states: "There was probably not a home in the city that did not become thoroughly acquainted with the conveniences of an electric iron as a household article."

The accompanying illustration shows the advertisement published in the daily papers announcing the winners. In addition to this, much publicity was given the contest in the reading columns.

In many similar contests most of the general publicity value has been lost through failure to publish the prize essays. The Hot Springs plan is therefore worthy of being more generally carried out.

Public Service Corporation Employees Purchase 4,359 Shares of Stock.

With subscriptions closed for the purchase of company stock by employees, the Public Service Corporation of New Jersey has announced that 829 employees have taken advantage of the offer to acquire stock on the installment-purchase plan, totaling 4,359 shares, or an over-subscription of 359 shares above the original allotment of 4,000 shares set aside by the company. The purchase was allowed at a price of $129 per share, instead of $130, as initially intended; the stock has a current market value of $133 per share. The stock subscribed represents a prospective investment of $562,311. Including the subscriptions of 1913, when a similar offer was made by the company, 1,656 employees of the corporation now hold stock to a total amount of $907,311, showing the interest and confidence of the employees in the company. The 1913 issue was of 3,000 shares at a price of $115 a share, payable in installments.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

USEFUL HELPS IN LAYING OUT MOTOR BELT DRIVES.

By W. F. Schaphorst.

The simple chart, shown in Fig. 1, will be found useful for determining pulley sizes; belt speeds; revolutions per

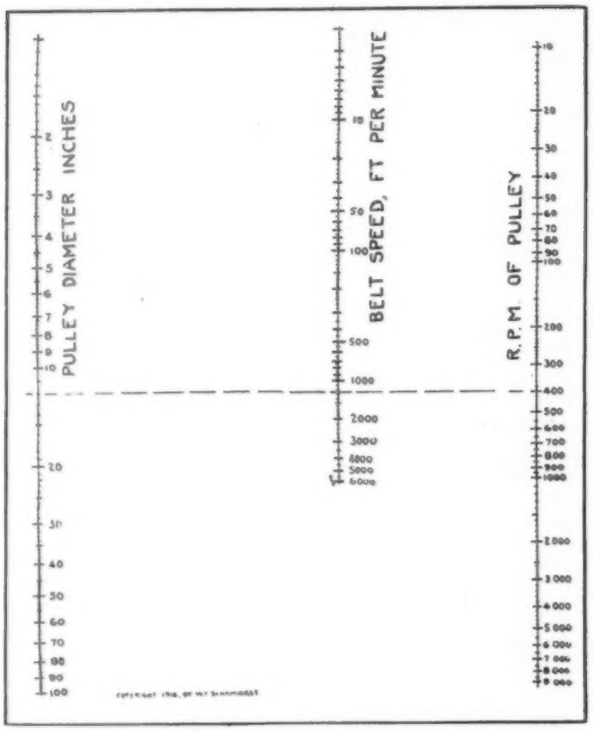


Fig. 1.—Chart For Determining Pulley Size.

minute made by pulleys, grindstones, saws, shafting, etc.; surface speeds of grindstones, saws, flywheels, etc.; and a hundred and one other things, because so much of our work is done by rotating machinery nowadays.

To use the chart, just lay a straightedge across from known point to known point and the problem is immediately solved.

For example, a 12-inch pulley (see left-hand column) makes 400 revolutions per minute (see right-hand column). What is the belt speed? See middle column: it says "1,250 feet per minute." That's all there is to it. A thread or string stretched across the chart will do just as well as a straightedge.

Where speed and diameter are known the revolutions per minute may be found in the same way. Any two points determine the third.

The handy chart, shown in Fig. 2, will solve a multitude of problems that ordinarily are vexing. All you have to do is—lay a straightedge across and there's the answer in the middle column.

For example, I want a chain for a 10-inch sprocket running at 500 revolutions per minute to transmit one horsepower. How strong must the chain be?

The dotted line drawn across the chart shows how it is done. Connect the 10-inch (column A) with the 500 (column C) and column B gives the answer immediately —25.2 pounds. In case a chain is wanted that will transmit 10 horsepower you would just multiply the answer by 10, which gives 252 pounds as the necessary strength.

In the case of a belt drive the chart can be used in the same way for determining "effective pull"—the difference in tension between the tight and the slack sides.

For rope drives the effective pull is found in the same way. In others words, the effective pull on a 10-inch rope sheave running 500 revolutions per minute must be 25.2 pounds in order to transmit one horsepower.

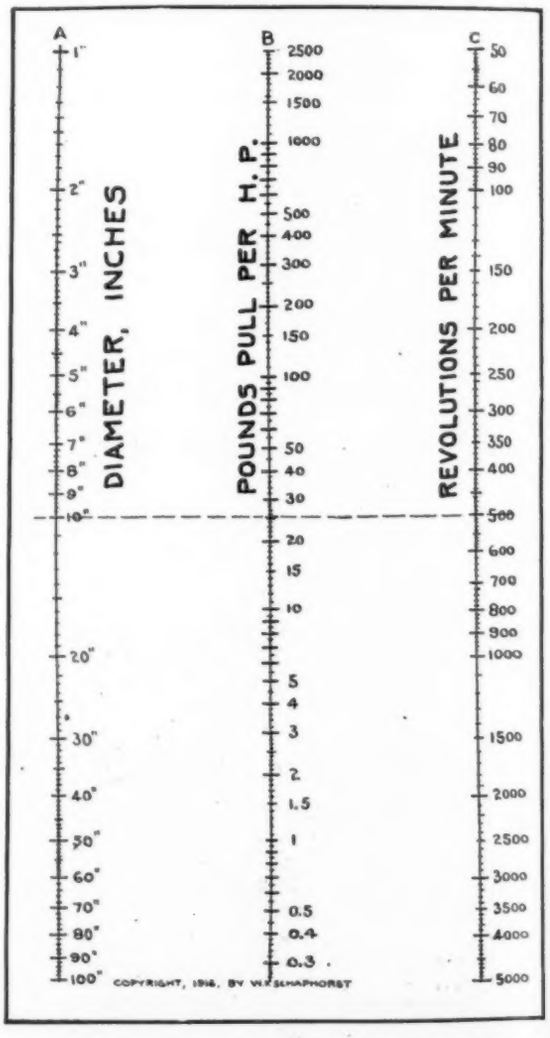


Fig. 2.—Chart For Use In Laying Out Motor Drives.

Knowing the effective pull, then, we can tell the manufacturer just how strong the chain, rope, belt or cable must be.

An Electric Pumping Installation With Unusual Features.

The pumping system of the city of Rocky Ford, Colo., which is served electrically by the Arkansas Valley Railway, Light & Power Company, consists of four deep wells with capacities of from 500 to 900 gallons per minute. The discharge from all wells is made to one point, a sump, which retains appproximately 10,000 gallons of water. After the water has been delivered to the sump a pressure pump delivers it to the city mains, which carries it to a reservoir of 600,000-gallon capacity.

This system is entirely controlled through the use of automatic compensators. The controlling wires of the compensator at each well are located at the power company's station. The switches controlling the compensators are given numbers corresponding with the number of the well. The city's daily demand is approximately 150,000 gallons, but should a greater amount be required, as during a fire, the attendant can step to one of the compensator controlling switches and practically double the quantity of water being delivered to sump.

A Convenient Form of Contract for Trial-Motor Installations.

The Edison Electric Illuminating Company, of Brockton, Mass., has made notable progress in securing important power contracts by adhering to the policy of offering to install the necessary motors on trial so that the customer may judge, to his entire satisfaction, the advantages and economies of central-station service. We present herewith a draft of the agreement which the company uses for this class of business. It will be noted that the trial is extended for one year.

This agreement made in duplicate this.....day of....., 1916, by and between the..... Company in the City of Brockton, Commonwealth of Massachusetts and the.....Company, a corporation duly organized according to law, and having an established place of business in the City of....., County of..... and Commonwealth of....., hereinafter called the Electric Company.

Witnesseth that: Whereas the.....Company is now driving its factory on.....Street by mechanical drive from its own engine, and

Whereas, the Electric Company is desirous of demonstrating the economy and efficiency of its central-station power service.

Now therefore, it is agreed that the Electric Company shall install, at its own expense, the following motors, which the Electric Company believes will efficiently drive the machinery of the.....Company, namely:

Basement	1 Motor, Total of	5. HP.
First floor	9 Motors, Total of	34.1 HP.
Second floor	14 Motors, Total of	66.5 HP.
Third floor	11 Motors, Total of	18.6 HP.
	35 Motors	124.2 HP.

and in addition thereto the Electric Company shall install wiring necessary to apply the above mentioned motors to the shafts and machines of the.....Company, and shall supply for a term of one year from date service is connected, the electric energy required to drive the motor hereinbefore mentioned.

If, after the motors have been installed, it is found that any one or more motors will not efficiently drive the machinery connected, the Electric Company agrees to replace such motor or motors with a motor or motors that will efficiently and economically drive the machines connected thereto.

The.....Company shall pay for its power service monthly, at regular rates shown in the published schedule.

The.....Company shall pay the Electric Company as a rental, and in monthly installments, 15 per cent of the total cost of the Electric Company's installation.

If, at the end of the year's trial period, the service rendered by the Electric Company is satisfactory to the .....Company, then the.....Company agrees to purchase within 30 days, the engine equipment installed by the Electric Company, less 60 per cent of the amount paid as rental, and further agrees to contract with the Electric Company for its power requirements for a period of one or more years, at the rate hereinbefore mentioned.

If, at the end of the year's trial period, the service rendered by the Electric Company is not satisfactory to the.....Company, then the.....Company shall notify the Electric Company, within 30 days, to that effect in writing, and the Electric Company agrees to remove its equipment within 60 days, or sell its equipment to the.....Company, as stated above.

The Electric Company makes no agreement and assumes no obligation to furnish current after any of its bills remain more than 20 days unpaid.

This agreement is subject to the customary terms and conditions of the Electric Company, as stated on form attached.

Electric Annealing Furnace Installation in Minneapolis.

Arrangements have been completed by the Minneapolis General Electric Company to serve an installation of electric furnaces in the tool shops of the Minneapolis Steel & Machinery Company, Minneapolis, Minn., which is now served electrically by the power company to the extent of 2,382 horsepower. This installation will consist of six individual furnaces and is the first of its kind in the Minneapolis district. It will be used for tempering, hardening and annealing tool steel.

Some of the advantages claimed for these furnaces are saving of time and the assurance of uniform results.

Motor Service Meets Emergency in Record Time.

A mill at Clinton, Mass., operating day and night on rush orders, met with the misfortune of having its steam engine break down. Repairs could not be made under three days. The manager of the local central-station company was called upon for assistance. He at once borrowed a motor from another local manufacturing plant, had his gang extend a three-phase power circuit, and in 12 hours had the mill working again.

The Value of Trial Motor Installations

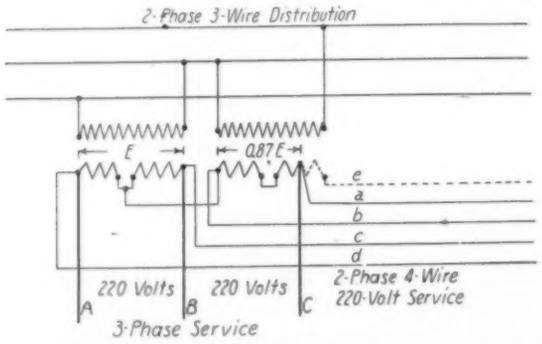
Although there has been little or no difficulty during the past 18 months in securing industrial power business, there are still many industrial establishments operating isolated plants that could profitably change to central-station service. How the skeptical managers of these plants are convinced of the advantages and economies of purchased power by installing motors on trial is explained in an article which will be published in our next issue. Power engineers of the leading central-station companies of the country explain the policies of their companies in this direction and there are numerous accounts of how particularly difficult prospects were made to become boosters for central-station service after a trial had demonstrated its advantages.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Two-Phase and Three-Phase Service from One Set of Phase-Changing Transformers.

It does not happen very frequently that a party using three-phase current derived from a two-phase service circuit by means of phase-changing transformers also requires two-phase current for the operation of two-phase electrical equipment that happens to be on hand. Such a condition, however, came under the writer's observation recently and the method of



Scheme for Obtaining Both Two-Phase and Three-Phase Service From a Single Set of Phase-Changing Transformers.

obtaining the two-phase current from transformers delivering three-phase secondary current, while exceedingly simple, had certain shortcomings that could easily be avoided in transformer construction.

As is well known, in a transformer designed for changing two-phase into three-phase current, one secondary is wound to deliver the voltage required between the three-phase lines. The other secondary is wound to deliver 0.87 of the voltage required between the three-phase lines. One terminal of this secondary constitutes one of the three-phase wires; the other terminal is connected to the middle of the secondary winding of the other transformer. One secondary therefore generates 0.87 of the required voltage and this voltage being in series with 0.5 of the voltage generated in the other secondary and 90 degrees out of phase with it, the combination of the two gives the required three-phase voltage. This is known as the Scott connection.

A party desiring to operate a few two-phase motors with four-wire lines made connections as shown by lines *a*, *b*, *c*, and *d*, in the diagram, lines *A*, *B*, and *C* representing the three-phase circuit. The only thing wrong with this procedure is that one phase of the two-phase circuit received only 0.87 of normal voltage, and while, practically, the difference was hardly apparent, the phases were unbalanced and the operation was by no means perfect.

If the secondary of the transformer delivering 0.87*E* had been wound to deliver *E*, as indicated by the dotted section of the coil, with two taps brought out, it would be possible to obtain *E* for two-phase service and 0.87*E* to be used in the phase-changing connection. Then by suppressing line *a* in the two-phase service and using the broken line *e* instead, we should be able to obtain two-phase and three-phase current without being compelled to purchase additional apparatus.

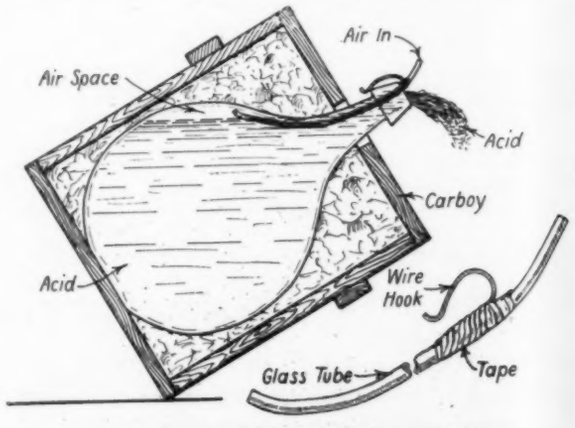
T. H. Reardon.

Pouring Acid from Carboys Without Spattering.

Trouble and serious damage is frequently caused from spattering of acid when pouring battery electrolyte or other acids from the carboys in which these are usually shipped. The contents of a carboy may be poured in a smooth, even stream, if a bent glass tube is used as shown in the accompanying sketch. The tube should be three-eighths or one-half inch inside diameter and may be bent by slowly warming a section about six inches long over a Bunsen gas flame; as soon as the glass has softened the bend can be made. The outer end need not necessarily be bent. A hook made of stiff, rubber-insulated wire is bent around the tube to permit hooking it over the mouth of the carboy so that both hands are left free to tip the carboy carefully and to direct the stream into the jar or pitcher that is to receive the acid. The tube lets air enter the carboy so as to displace the acid flowing out and thus allows a uniform steady stream to flow without spattering.

If a wire hook is made as shown, it must be thoroughly taped with rubber tape to prevent any metal being exposed to the action of the acid. This is not so much to protect the hook from being corroded, as to prevent the acid from being contaminated from solution of the metal of the wire hook, which is especially to be guarded against if the acid is for use as storage-battery electrolyte, or for other purposes where pure acid is needed. If purity of acid is especially important, it would be better not to use a wire hook, but instead of it to bend the upper end of the glass tube back so that it forms a hook itself. This requires more skill in bending glass and more care in handling the vent tube in use.

Carboys, as a rule, are heavy, and unwieldly things to handle when filled with acid, especially strong sulphuric acid; such a carboy may weigh over 200 pounds. To make it easier to tilt such carboys a number of specially



Vent Tube for Pouring Acid From Carboys.

designed and very convenient carboy inclinators are available on the market. A good inclinator should be used where carboys are to be handled frequently. They make for safety and also enable a single man to pour out their contents.

L. M. Dellinger.

Up-to-Date Fire-Alarm System of Somerville

Description of the Arrangement, Wiring and Operation of the New Fire-Alarm System, Which Insures Safety, Reliability and Speed in Handling Alarms

By GEORGE A. BRODER

THE NEW central-office fire-alarm system recently installed for the City of Somerville, Mass., by the Gamewell Fire-Alarm Telegraph Company, of New York, was put into service on December 15. In this system the latest ideas in municipal fire-alarm telegraphy have been carried out in every detail of the new apparatus and appliances to insure safety, reliability and speed in receiving and transmitting all alarms between street signal boxes and the central office, and between the central office and engine houses throughout the city.

The new equipment is housed in a fireproof building constructed for the Fire-Alarm Department, adjacent to the central fire station at Highland Avenue and Medford Street, where it is centrally located. The ground floor is devoted to space for the service car and construction and maintenance departments and the second floor to the apparatus and battery rooms. Operators' sleeping quarters, shower baths, and recreation rooms are on the third floor.

The old automatic system formerly in use consisted of a six-circuit automatic repeater and storage-battery and protector switchboards, connected to six street-box circuits, operating at 2.5 seconds time.

With the new system much valuable time will be saved in the receiving and transmitting of an alarm, as the boxes and fast-time apparatus operate at 0.75 second or three times as fast as the old system, while the slow-time circuits operate at 2.5 seconds time between blows, similar to the old system.

Method of Operation.

With the new system an operator is required to be on constant duty to receive and transmit fire signals and operate the private-branch-exchange telephone switchboard, which connects with all engine houses for department calls, and with the New England Telephone Company's lines by three trunk circuits for public calls.

Normally the system is operated manually, that is, an alarm of fire originating at a street signal box is received at the central office by visual and audible means on the operating switchboard and goes no further.

After the first signal round is received, the operator immediately sets that box number up in duplicate on the one-dial, four-number, two-speed manual transmitter and sends two complete rounds at fast time over the tapper circuits to every engine house in the city, where it is

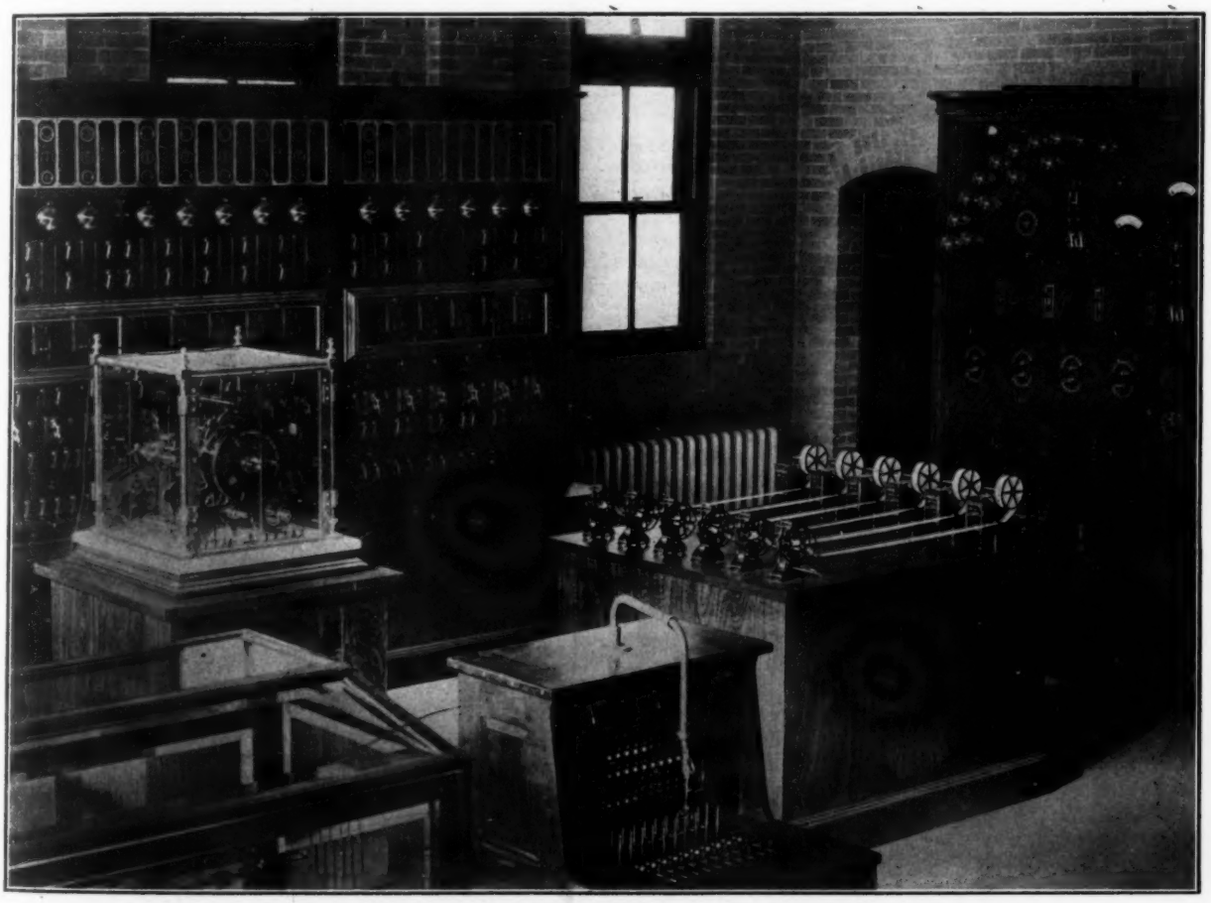


Fig. 1.—General View in Central Office of New Fire-Alarm System of Somerville, Mass.

At the rear on the left side is shown the combination gong and tapper board with one of the two six-circuit operating boards at its right. In front of this is the fast and slow-time manual transmitter and in the center foreground is the private branch telephone board. To its left is part of the automatic tapper repeater and to its right is one of the six-circuit box-recording registers. At the extreme right is part of the storage-battery charging switchboard.

Fig. 2.—View of Somerville Central Fire-Alarm Office Taken From Opposite Corner to That Shown in Fig. 1.
The protector switchboard is in the rear. Fast and slow-time recording sets are at the left of the telephone board which is seen in the center. To the right of it is the twelve-circuit automatic tapper repeater. The fast and slow-time manual transmitter appears in the right foreground. To the right and left of it are box-circuit recording registers, six in each group. On the rear wall is a master self-winding clock.

visually and audibly received by punching registers and tap bells, and at the same time recorded on a paper tape. Two rounds are then sent out at slow time over the gong circuits by the same transmitter, by reducing the speed, and publicly sounded on tower bells in each engine house.

To operate the system semi-automatically, the operator, after receiving the first complete round of an alarm, immediately cuts that particular box circuit into its corresponding magnet coil on the tapper repeater, by throwing the semi-automatic switch of that circuit to its "on" position, thereby locking all other similar switches. The remaining one or three rounds will be automatically repeated at box speed over all tapper circuits without further manual intervention, being controlled entirely by the operating street box. The slow time is then set up by the operator on the manual transmitter similar to ordinary manual operating.

In case of an emergency, when an operator is absent, the system may be operated automatically as far as the fast-time circuits are concerned, by leaving the repeater-controlling and tapper-circuit switches at their "on" positions, which connects a repeater magnet coil in each box circuit, and the fast-time circuits to the repeater-cylinder transmitting springs.

If an alarm should come in on any one box circuit, that particular circuit will function the repeater to transmit the complete signal over the tapper circuits; should two or more boxes on different circuits be pulled at or about the same time, their signals will not interfere. The slow time has to be set up on the manual transmitter and two complete rounds transmitted as in the first case.

The equipment is designed for an ultimate total capacity of 32 circuits and at present there are 24 connected working circuits, consisting of 10 box, five gong, five tapper and four intercity or "foreign" circuits connecting to nearby cities, by which Boston, Cambridge, Arlington and Medford alarms are received, and Somerville alarms transmitted to the same cities by a multiple relay connected in one of the tapper circuits.

Method of Wiring.

All outside lines enter the basement in multiple-conductor lead-covered cables of No. 14 rubber-insulated wires and connect to terminal blocks on the rear of the protector switchboard. Here all lines are protected from lightning by carbon lightning arresters, and from excessive current by a small overload circuit-breaker, which trips at 0.5 ampere, and also by 0.5 ampere, office-protecting fuses.

From here all lines connect to the storage-battery charging switchboard by No. 14 rubber-covered-wire cables in three-inch fiber ducts, laid in the concrete floor and cross-connected to give easy access to any piece of apparatus by the shortest route.

Central-Office Equipment.

At the storage-battery switchboard line rheostats, testing instruments and switches are provided for each circuit and double-pole, double-throw battery knife switches to change from the A to B set of batteries for alternate charging and working lines.

The box circuits connect to the individual punching registers in each circuit and to the operating switchboards at each end, where visual and audible indications are given on the operating circuit, then to repeater, manual transmitter and back to the protector switchboard, where each side of every circuit can be tested for voltage and current to ground.

The gong and tapper circuits connect to the combination slow and fast-time switchboard, shown in Fig. 3, and then to the repeater, manual transmitter and back to the protector switchboard. Both visual and audible indications are given on the combination switchboard of the transmission of fast and slow signals and a line relay in each circuit operates each electromagnet armature and shear of a five-circuit multiple-pen shearing-type register and time stamp, which records and prints the exact time an alarm is transmitted.

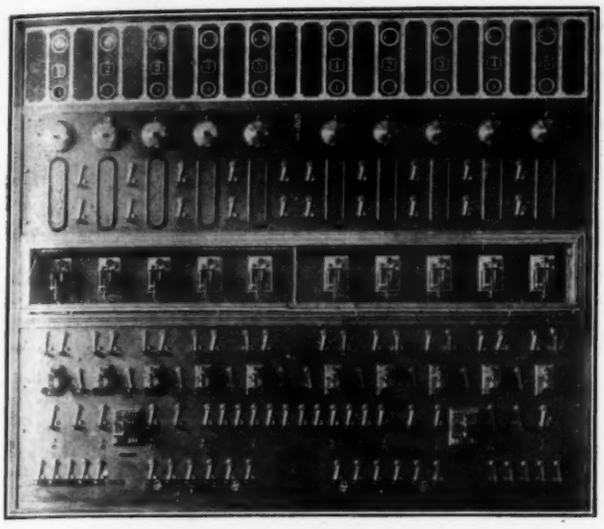


Fig. 3.—Ten-Circuit Combination Gong and Tapper Switchboard.
Consists of five gong or slow-time circuits at the left and five tapper or fast-time circuits at the right. The order of devices on each circuit is as follows: flashing bull's eye at the top, then annunciator, tap bell, box list frame, line relay (incased), individual key, multiple key, and automatic-manual ganged switches. Repeater switches are shown in center at the bottom. The small single switches cut off any one of the individual devices mentioned above.

A common recording set, consisting of a punching register, take-up reel, and time stamp, is installed in the superintendent's office and operated from any box-line relay through a 20-volt local battery. The manual transmitter and 12-circuit automatic repeater are weight-driven and mounted on four-foot art metal pedestals and easily accessible by sliding doors.

All switchboards are of one-inch Monson slate, free from metallic substances and wax-filled, mounted in ornamental metal and Circassian walnut frames.

Storage batteries in duplicate sets are mounted on five metal racks with insulators. The total battery equipment consists of 1,280, six-ampere-hour Chloride accumulator, couple-type cells in glass jars, supported on glass strips resting on porcelain insulators. They are charged in parallel-series groups from the 550-volt, direct-current railway circuit through 30-watt resistance lamps arranged in series-parallel groups on the storage-battery controlling switchboard, to give 0.75-ampere normal charging current.

Street Boxes and Box Circuits.

At present there are 140 street boxes of the non-interfering and successive types connected in series loops, averaging about 16 to a circuit, on closed constant-current circuits with 0.09 to 0.1 ampere continually flowing.

The greater part of the outside lines are underground. In the central portion of the city the boxes are mounted on ornamental pedestals, and on wood poles in the residential localities, where the lines are run on the top cross-arm of combination poles.

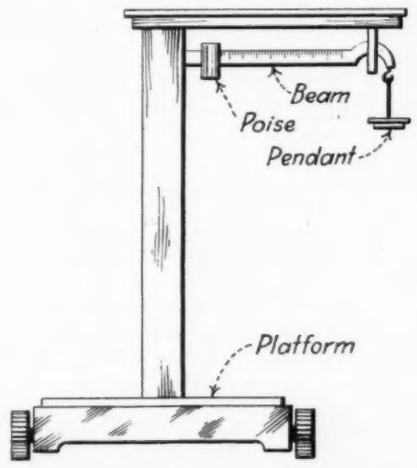
The complete installation was under the supervision of A. D. Wheeler, the New England agent of the Gamewell Company, and erected by A. G. Colburn and the writer. M. I. Fuller is Commissioner of Wires and Superintendent of Fire Alarms for the City of Somerville.

Weighing Bulk Stock Supply to Determine the Number of Pieces.

When taking an inventory, much valuable time is frequently spent in counting out broken packages and odd lots of small pieces, such as knobs and tubes, for instance. When the weight per 100 or 1,000 of a given article is known, the count can, of course, be easily determined by comparison with the weight of the stock, but if this unit weight is an unknown quantity, a simple and fairly accurate means of determining a count is furnished by an ordinary beam scale.

When the poise of a scale is set at the zero index on the scale beam, and there is no weight upon the pendant at the end of the beam, the beam should balance, provided there is no load on the platform. Now, if a "100-pound" weight (which actually weighs 1 pound) is placed on the pendant, the beam will come to a balance when 100 actual pounds are placed on the platform. From this it is evident that the ratio of the unit on the platform to the unit on the pendant at the end of the scale beam is as 100 to 1.

Now, with the poise at the zero index on the scale beam and no weight on the pendant, if a single porcelain tube were placed on the pendant, the number of tubes of equal size and dimensions required to be placed on the platform in order to balance the beam, would, in accordance with the above ratio, be 100. Again, if it were required to "weight out" 500 tubes, it would merely be necessary to balance the beam, place five single tubes on the pendant, and then load up the platform with similar tubes until the beam balanced. Where the number of pieces is less than 100, they should, preferably, be counted, unless the average weight of each is quite well known.



Platform Scale Used for Rapid Determination of Number of Pieces Instead of Counting Them.

Even then, if it would take longer to weigh them and make the necessary calculation, it would be foolish to do so.

The New York Central Railroad has awarded a contract to G. M. Gest for the installation of cables in underground conduits between its power station and Pier No. 8, West New York, N. J.

The Enterprise Electric Company, Grand Rapids, Mich., has been awarded the contract for installing a boulevard lighting system in Leonard Street Northwest, in that city. There will be 92 standards, installed at a cost of $31 each.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 372.—Electrolytic Rectifier.—I should like to have given the general specifications of a 100-watt, 110-volt, electrolytic rectifier of the carbon and aluminum type.—H. N., Chicago, Ill.

No. 375.—Cost of Direct-Current Motor Repairs.—I would like to secure data in tabulated form on the cost of repairs to direct-current motors. These data should give the horsepower, speed, size of frame, type of armature winding, type of field winding, bearings per set, brush holders per set, painting and crating. Is such a table in general use by motor-repair firms as standard practice, subject to market price of materials used?—C. R. R., Blairsville, Pa.

No. 376.—Boosting Charges for Storage Batteries.—What is the effect on the efficiency and life of the storage battery in an electric motor bus of giving a boosting charge of about half an hour at the end of each run? Does such frequent charging have a tendency to disintegrate the plates more rapidly?—R. V. T., Cincinnati, O.

Answers.

No. 373.—Illumination for Photographing Motion Pictures.—About what intensity of illumination is necessary to take a motion picture successfully in an interior? What kind of lighting is it best to use for this purpose?—J. S. C., St. Paul, Minn.

As no definite size of studio was given it is rather difficult to recommend any exact installation, but for an interior scene of approximately 900 square feet or a studio 30 feet square, an energy consumption of 20 to 30 kilowatts should give an ample intensity. This consumption will be divided between the various lighting units in accordance with the demand of the scene being photographed. It has been found from the best practice and experience that a highly diffused light source of fairly high intensity for top lighting, side lights of higher intensity but more diffused, and several spot lights are needed.

Without question, the best light now being used for movie work is that given by the white-flame arc lamp. The advantages of this type are many and may be enumerated as follows: high speed, exact duplication of daylight, low cost per unit, portability, constancy of operation on poor regulation.

Since the exposures are to be practically instantaneous the speed of the light used is a most important factor. The white-flame arc allows an average exposure of one-thirty-second of a second; at least 16 pictures must be taken every second.

Color value is perhaps the most important factor to be considered, since the acting of pleasant scenes under lamps which will not faithfully portray colors is almost impossible. To obtain correct color reproduction under any other light it is necessary for the actors to smear their faces with paints calculated to bring out correct color values. This has led to a number of refusals by them to work under any light other than white light. The light of the white-flame arc is almost an exact duplication of north-sky daylight on a June day, and therefore contains light of every wave-length. In this connection it may be mentioned that to obtain high speed with incandescent lamps they are frequently run at high voltage, resulting in a great deal of heat and very short life. It was brought out in a recent article that it was necessary to turn off these lights at intervals on this account. The white-flame arc has no such heating obstacle. The cost of such an installation is low compared with others.

These lamps may be made extremely portable by mounting on frames and castors and weigh less than most installations of like power. They are readily controlled by rheostats, lending themselves readily to the securing of artistic effects.

Regarding the actual distribution of the above-mentioned energy consumption, there should be two or three top lights equipped with diffusing reflectors, along with side lights covered with some sort of fireproofed white material, such as Lonsdale cambric. This last is necessary to keep the light out of the actors' eyes and to soften down the tone of the whole scene. Finally spot lights should be provided if the high spots of the action are to be stressed.

Above all, it should always be borne in mind that the conditions and surroundings should be of such a nature as to banish from the actors' minds the idea that they are surrounded by anything but the scene in which they are playing. It is with this idea uppermost that studio lighting should be designed.—A. Arnold Brand, Cleveland, O.

The degree of illumination required to photograph properly a motion-picture scene or set depends in general on: (A) The depth of the set. (B) The color (with regard to absorption of light) of the scenery, fixtures, costumes, etc. (C) On the rapidity of action to be photographed.

The first is the most important variable, as it determines the aperture or opening of the camera lens necessary to obtain sharpness of detail in all parts of the set, a deep set requiring a small aperture and a large amount of light, while a shallow one may be photographed with much less illumination and a larger diaphragm opening. These variables make it impossible to use a fixed intensity under all conditions.

The average illumination for typical stages used in the best practice is about as follows: For sets averaging 30 feet in depth, 300 foot-candles normal to stage from overhead lights and 350 foot-candles parallel to stage from side lights. For sets averaging 20 feet in depth 225 foot-candles from overhead and side lights each. For sets averaging 10 feet in depth, 150 foot-candles from overhead and side lights.

The illumination referred to above is actinic light only, light of longer wave-length than green being useless and not to be considered in computing the effective illumination received from the lights.

Very often the energy necessary for motion-picture lighting is expressed in watts per square foot of net stage area, this area being that of the trapezoid included between the front cut line, the back of the stage and the wings or side cut lines. If the current is expended in vapor lamps and arc lamps, in the proportion of about 80 per cent in the former and 20 per cent in the latter, the watts per square foot for a 30-foot set will average 125, for a 20-foot set 100, and for a 10-foot set about 70. All the above figures are averages rather than actual cases and are subject to variation under any special conditions.

Lamps for motion-picture work should be selected with respect to their possession or lack of the following qualities, named in the order of their relative importance:

(1) High efficiency in the production of actinic light. (2) Low intrinsic brillancy. (3) Steadiness of light. (4) Low cost of maintenance. (5) Simplicity and reliability. (6) Low first cost.

The first is essential on account of the excessvie heat generated where only a small proportion of the current is converted into actinic light and also for current economy. The second and third requirements are essential for the actors' eye comfort and assist them in maintaining natural face expression. Quality four tends to keep down cost of operation. Number five is necessary for continuous and economical operation.

Although low first cost is acceptable, it is not desirable at the expense of any feature which will raise the quality or quantity of the film produced, the value of the product being so very large in comparison with the cost of the best lighting equipment that it is faulty economics to curtail any necessary expenditure of capital for this feature of the studio.—J. Howard Sandidge, Chicago, Ill.

BOOK REVIEWS

"Principles of the Telephone. Part I. Subscriber's Apparatus." By Cyril M. Jansky and Daniel C. Faber. New York: McGraw-Hill Book Company, Incorporated. Cloth, 160 pages (6x9 inches), 125 illustrations. Supplied by Electrical Review Publishing Company, Inc., for $1.50.

This volume was prepared in the Extension Division of the University of Wisconsin to cover the first part of a course in telephony, outdoor lines and central-exchange equipment being left for future treatment. The subject has been treated in a way that will appeal to men actually engaged in the work, both text and illustrations being practical, lucid and modern. Each chapter is accompanied by a list of questions intended to test the reader's grasp of the subject.

The first chapter is introductory. The next three chapters deal with elementary principles of electricity, magnetism and sound. Transmitters and receivers each have a chapter devoted to descriptions of the more common types in use in this country, but no attempt is made to include all the types which would be found in a historical work or a complete treatise on the subject. The seventh chapter deals with signalling apparatus and circuits, and the following three with the subscriber's set, local-battery systems and common-battery systems. One chapter is devoted to faults and fault-finding, one to protective equipment and one to installation work. Two chapters on party lines and intercommunicating systems complete the list, but equipment for an automatic exchange system is not included. A detailed table of contents and an index make it easy to locate references to any particular item. The chapters are short, but each gives the fundamental and essential facts connected with its subject. The matter is well presented and well illustrated and is the best publication covering this particular field that the reviewer has yet seen.

"Electrical Engineering: Advanced Course." By Ernst J. Berg. New York: McGraw-Hill Book Company, Incorporated. Cloth, 332 pages (6x9 inches), 163 diagrams. Supplied by the Electrical Review Publishing Company, Inc., for $3.50.

This is the second volume of a Course in Electrical Engineering. The first volume was published some months ago as the joint work of Professors Berg and Upson. The second volume is an outgrowth of a series of lectures delivered by the author to graduate students at the University of Illinois, and at Union College. The book is divided into two parts. The first part of 156 pages is practically a reprint of a series of articles published in the *General Electric Review* a few years ago. The subjects treated in this part are: circuits containing concentrated and distributed inductance and resistance; characteristics of condensers; circuit containing distributed leakage; circuit containing distributed resistance and capacity; distributed inductance and capacity; permanent conditions when one of the four constants R, L, G, and C is negligible; distribution of flux or current in a cylindrical or flat conductor.

Part II comprises 169 pages and is concerned with problems in electrostatics. A chapter on partial differentiation and one on the elements of vector analysis close the theoretical discussion and a brief index completes the book.

One may with propriety call this an advanced text on electricity and magnetism. It differs from the usual texts on the subject in that a close correlation is made between theory and its application to practical problems, and also in that the actions and transient effects of alternating currents in different circuits are considered. This correlation of theory with practical problems is a very valuable feature of the text. While the subject matter of the book is not new and the treatment is highly mathematical, it is nevertheless comparatively simple and within the comprehension of students who have had a good course in undergraduate mathematics and physics. It will undoubtedly serve a useful purpose in showing students the practical importance of mathematical analysis in a field which, to the majority, is at present closed. Although there is so much to commend about the book, a word of adverse criticism may not seem out of place. All first editions are in some respect like college freshmen, entitled to a certain number of lapses from strict conformity to established rules; an excess, however, results in censure. It is unfortunate that so many typographical and other errors were permitted to remain. The errors are so numerous that the reader is compelled to check carefully the tables and formulas. An errata sheet should be furnished with the book.

The sesame of the day is service, and in this respect both the author and publishers are to be commended, for they have performed a valuable service in bringing this book before the engineering public.

C. M. JANSKY.

"Studies in the Cost of Urban Transportation Service." By F. W. Doolittle. New York: American Electric Railway Association. Cloth, 467 pages (6x9 inches), illustrated.

The increasing percentage of the population which chooses to live in cities has intensified the problem of urban transportation. The necessity of adequate transportation facilities is universally recognized, but the actual cost of the service is a mooted question. This volume is the report of the director of the Bureau of Fare Research, established by the American Electric Railway Association in 1914, and is primarily concerned with the financial matters incident to the construction and operation of electric railways. A vast amount of statistics and other information has evidently been analyzed. The results of this analysis have been embodied in a large number of tables and diagrams. References to the reports of public utility commissions and other public documents are frequently made, and afford ready access to the detailed information on which a statement or conclusion is based.

The subject matter is divided into five sections as follows: (I) "The Occasion for Cost of Service." Organization and financing of a railway company, organization of operating departments. (II) "Elements of Cost." Proportionate division of fare, tendency of operating costs to increase, capital for public utilities, return on invested capital. (III) "Elements of Service." Traffic characteristics and observations, prescribed standards of service, psychological aspects of railway operation. (IV) "Special Problems." Paying hauls, cost of complying with standards of service, cost of extending the transfer privilege, competing forms of transportation, effect of rate of fare on the riding habit, rapid transit. (V) "Regulation and Cost of Service." Outline of the Cleveland and Milwaukee experiments in reduced fares.

Mr. Doolittle has accomplished a most difficult task in that he has made this report quite "readable," not simply a volume of statistics. It is a most acceptable addition to the published literature relating to transportation rates and costs.

J. F. WILSON.

"Examples in Alternating Currents. Vol. I." By F. E. Austin. Second edition. Hanover, N. H.: Published by the author. Flexible leather, 223 pages (4¼x7½ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $2.40.

The favor with which this book was received is evidenced by the need for a second edition so soon after the first. It has been used to some extent as a textbook, but its greatest usefulness is in testing the reader's knowledge of the subject by applying it to numerical problems. The number of problems has not been changed, but there has been an addition of some illustrations. In the introductory matter, the value of a radian is incorrectly stated in two places on page 7, but this should not be misleading, as it is given correctly elsewhere. Mathematics is used freely by the author and an ample mathematical consideration of an alternating-current wave is given.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Bryant Sockets Providing Individual Control for Candle Fixtures.

Various efforts have been made from time to time to provide individual control for candle fixtures without destroying the symmetry of appearance or the rigidity of construction of the fixture.

In the Bryant medium and candelabra base, candle pull and turn sockets, however, as will be noted from the detail views, these two ideas have been fulfilled. In both devices the substantially designed operating mechanism is rigidly fastened near the top of the candle. By this arrangement, advantage is taken of space within the candle which has heretofore been wasted, and ready access is provided to the binding screws for wiring. Because the mechanism and parts are not crowded together, the danger of short-circuit is practically entirely eliminated.

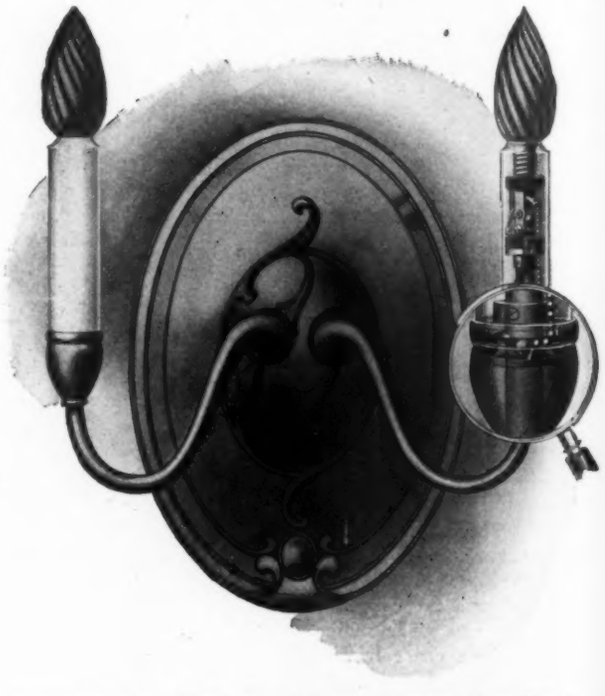
Furthermore, the arrangement of the mechanism lends itself to practically any design of fixture, as the bobeche may be made as small as might be desired, while the cup may be liberally proportioned without interfering in any way with the perfectly satisfactory operation of the switch. As will be noted from the illustrations, the chains from the pull sockets Nos. 540 and 4120 hang perpendicularly in the candles and are carried through very small holes in the bobeche and candle cups, leaving only enough chain extending from the bottom of the fixtures to permit of easy location and operation of same.

Bryant Candelabra Pull Socket (No. 540).

Medium-Base Candle Pull Socket (No. 4120).

In the turn devices, Nos. 560 and 4121, two circular superimposed disks are provided. These two disks, in addition to the sockets Nos. 540 and 4120 can be inserted in any fixture by firmly fastening the upper one to the pipe stem with the lower disk securely fastened in the bobeche or candle cup. The rotation of the latter, in either direction, will pull the chain down sufficiently to operate the socket. In this way the entire operating mechanism is completely hidden from view and the very daintiest candle fixtures can be made up with individual control of lights. It will be noted that the bead chains are provided with a splicing link close to the fixture proper which permits the fixture manufacturer to disconnect the lower exposed portion of chain for special finishing to match the balance of the fixture.

In the medium-base device, the mechanism is firmly supported within a liberally designed molded insulation block of nonbreakable material instead of the old-style porcelain block, while the candelabra base is supported by three heavy brass "legs," which absolutely prevent any side-play even when the pull chain is actuated by a sudden jerk. The switch mechanism consists of a thick insulated disk with pawl spring and ratchet contact and escapement. Another feature worthy of note to the fixture manufacturer is that these sockets fit inside standard porcelain and fiber candles. The devices described are manufactured by the Bryant Electric Company, Bridgeport, Conn.

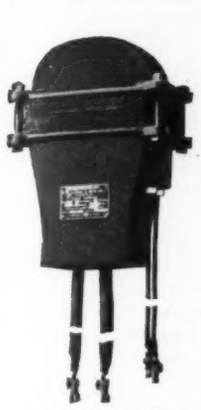


Candelabra Turn Socket (No. 560) with Enlarged View Showing Detail.

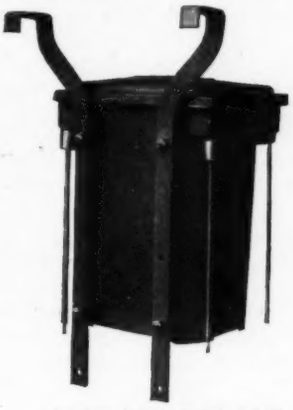
Safety Coils for Series Alternating-Current Circuits.

For use where the voltage of series arc or incandescent alternating-current circuits is too high to permit the safe installation of lamps, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed the safety coils illustrated. These coils are for indoor and outdoor service, and are especially useful on installations where a series lighting system is desirable, but high voltages are impracticable, as, for instance, on streets with numerous trees where to run the main series circuit would result in trouble from grounds; on bridges and in subways where the

high voltage of the regular series circuit is prohibitive; also for lighting fire-alarm, police-call, and letter boxes, where high voltages so near the ground would prove dangerous.



Dry-Type Safety Coil.



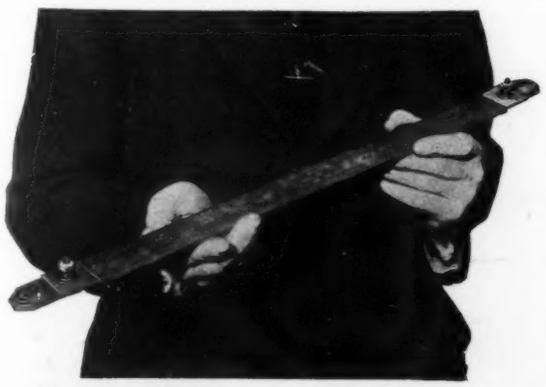
Oil-Insulated Safety Coil.

They are also invaluable where but a few lamps are required in a building and a multiple circuit is not available.

These coils are essentially one-to-one-ratio series transformers, insulated for high potentials. They are tested for 20,000 volts for one minute between windings and between windings and iron. The smaller capacities of these coils are built for air cooling, and are of the same form of construction as the standard Westinghouse dry-type current transformers. In this case the magnetic circuit, having laminations exposed to the air, is clamped between cast-iron end caps which protect the windings, the leads extending downward through suitable bushings in the bottom end-cap. The coils are impregnated with an insulating compound, which thoroughly seals up the joints between the laminations and the end-caps. The larger capacities of these coils are oil-insulated, and are of the same form of construction as the oil-insulated distributing transformers made by the same company. When installed, the primary of the coil is connected in the regular series circuit, the secondary then supplying the lower-potential series circuit. Regular series lighting fixtures should be used. The necessary oil and hanger irons for pole mounting are furnished with the oil-insulated coils.

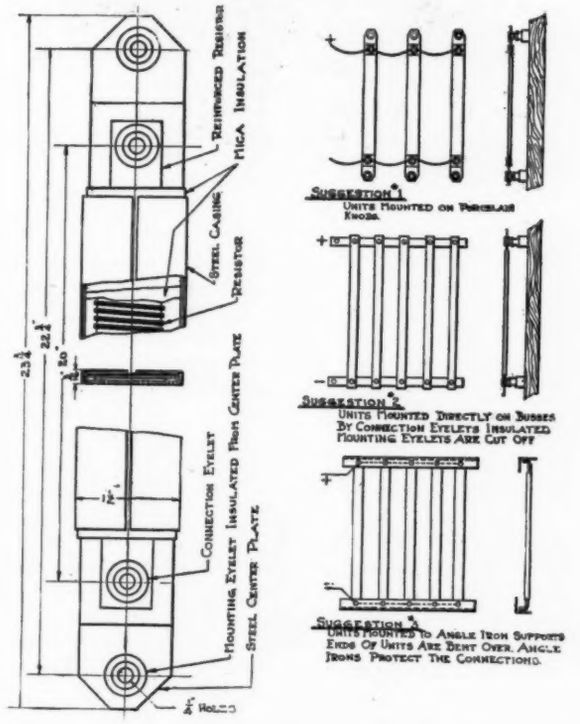
Electric Heating of Crane Cabs with Inclosed Heater Units.

After the first of November the cabs of outdoor cranes usually become uncomfortable for the operator because of the cold. Various methods of heating these cabs are in use, but



C-H Type "H" Steel-Jacketed Electric Heater Unit.

nothing entirely successful from all standpoints has been developed. Space is at a premium and for this reason grid resistance banks, because of their dimensions, are usually unsuitable. The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has been adapting its type H inclosed steel-jacketed heater unit for many industrial heating applications, including the heating of crane cabs. Such men as crane operators and shearmen and cablemen in steel plants can keep their bodies properly clothed and warm but their feet will get cold in most cases. By supporting a heavy perforated metal plate about two inches from the floor and placing these flat H units in the air space between the plate and the floor a warm air current will circulate up through the perforations. Additional units may be distributed at other points for raising the temperature to a comfortable degree, a minimum of space being required. The units have a capacity of 500 watts and can be used on either direct or alternating-current systems. They are 1.5 inches wide, 0.1875 inch deep and 2 feet long, just like a flat ruler. They require no assembly of parts and can be installed singly or in groups connected in multiple like so many lamps. All parts being inclosed, they are not easily damaged by mechanical abuse or vibrations. The steel jacket


Reinforced Resistor
Mica Insulation
Steel Casing
Resistor
Connection Eyelet
Mounting Eyelet Insulated From Center Plate
Steel Center Plate
Suggestion 1.
Units Mounted on Porcelain Knobs.
Suggestion 2.
Units Mounted Directly on Busses By Connection Eyelets Insulated Mounting Eyelets Are Cut Off
Suggestion 3.
Units Mounted to Angle Iron Supports Ends Of Units Are Bent Over Angle Irons Protect The Connections.

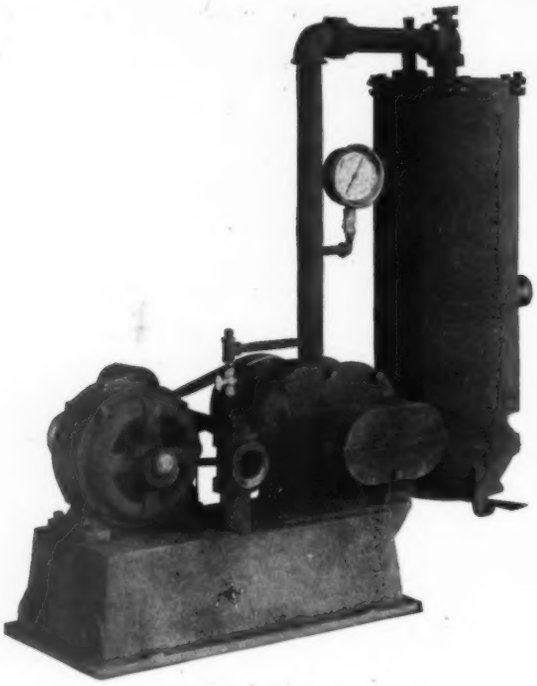
Details of Inclosed Heater Unit and Suggestions for Mounting.

entirely incloses the nickel-chromium resistor, which is in turn inclosed in mica.

Insulated eyelet terminals are provided for mounting. Standard units are made for 115, 230 and 250-volt circuits. They eliminate the fire hazard and, since the resistor is doubly insulated, there is no chance of grounds. In mounting only sufficient clear space need be provided to permit free movement of air. Several suggestions for mounting are shown in the accompanying sketches.

The Atwood Stationary Electric Vacuum Cleaner.

Vacuum cleaning depends upon two main factors, vacuum and volume or air displacement. The proper adjustment of these factors is different for bare-floor work from what it is for carpet or for rug work. On bare floors a large volume of air is required with comparatively low vacuum, while for carpet and rug work a much higher vacuum and comparatively small volume is required to draw the dirt from the bottom of the fabric. The Atwood cleaner,



Atwood Stationary-Type Vacuum Cleaner.

made by the Atwood Vacuum Cleaner Company, of Rockford, Ill., combines both features in one machine. It provides a large volume of air for bare-floor work, and when used on carpets and rugs will automatically create the higher vacuum necessary for thorough cleaning. This cleaner usually operates on a medium vacuum with a maximum of from five to 12 inches by mercury measurement, depending upon the size of machine and surface being cleaned.

The cleaner illustrated is known as a single-sweeper machine and is made in four sizes. Slow-speed Westinghouse direct-current or alternating-current motors are used for driving these cleaners. Endless-belt drive is employed with automatic adjustment of tension by means of a gravity idler. The motor and exhauster are mounted on a heavy substantial cast-iron base, which is hollow and contains a large quantity of water for automatically sealing the exhauster. An automatic unloading valve is also provided which operates at any desired vacuum. When the system is closed this valve removes about one-half the load from the motor, while with the general run of cleaners the motor has its maximum load when the system is closed.

The machine shown is the one most commonly used for residences. It is driven by a one-half-horsepower motor and gives a maximum vacuum of five inches, mercury. The exhauster operates at 750 revolutions per minute and has an air displacement of 50 cubic feet per minute. Other sizes require 0.75, 1.5 and two-horsepower motors, and maintain a maximum of seven, eight and nine inches of vacuum, respectively.

The exhauster is of the two-shaft rotary type, operating a water seal. Two impellers, each shaped like the figure 8, rotate a pair of gears in a case with slight clearance between and all around them. There is no contact whatever inside the exhauster, hence no friction or wear. The impellers are made of a solid composition metal and connot rust. Each revolution of these impellers carries around and discharges into the base four large pockets of air, thus making the flow of air positive and maintaining any desired vacuum within the capacity of the cleaner. The sealing water is drawn up automatically from the base, and in passing back through the exhauster fills the clearance spaces between and all around the impellers, making their action positive. This water seal increases considerably the efficiency of the exhauster and requires no adjustment or attention except the occasional replenishing of the water in the base. This water is used over and over again and is lost only by evaporation.

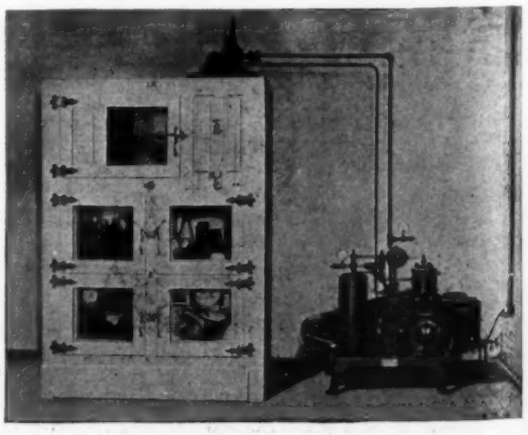
Separation of the dirt is accomplished by means of a bag fastened to the top plate of a tank and extending down around a bag ring at the end of bag rods and then up in the middle, where it is fastened to a chain for shaking. By this means a large screening area is obtained which can be easily and positively cleaned without opening or touching the bag.

The Atwood cleaner is furnished as a stationary plant for installation in the basement and is piped for hose attachment at each floor. Switches are also furnished for each floor, so that the cleaner may be started and stopped from any station. The equipment includes a carpet tool, under-furniture tool, upholstery tool, floor tool, wall or dusting brush, radiator tool, tufting nipple, cleaner handle and cleaner-handle elbow.

McClellan Electrically Driven Ice Machine for Refrigerators.

At all seasons of the year a very important element in the preparation of food is the economical and efficient refrigeration of foodstuffs, whether for home, hotel, restaurant or store. While food may be kept cool by means of ice, it is practically impossible to maintain the ice box, at all times, at a temperature sufficiently low to keep the food in perfect condition. To be kept perfectly, foodstuffs should be stored in a dry temperature, uniformly maintained at about 40 degrees Fahrenheit. This temperature cannot be maintained with ice, as the melting of the ice lessens the amount in the box, and a slow rise in temperature occurs, resulting in spoilage of the food stored therein. Another objection to ice is its uncleanness, sediment being deposited in the ice box as the ice melts, thus frequently permitting germs to mingle with the food. These objects have long been recognized, and the ideal method sought would embody the principles of cleanliness, uniformity of temperature and avoidance of waste by spoilage. Modern electric refrigeration alone includes these three principles. It is well exemplified by the McClellan system of refrigeration, made by the McClellan Refrigerating Machine Company, Chicago, Ill.

The McClellan system consists of a specially designed, small, compact, high-efficiency refrigerating machine (known as the "World's Wonder" ice machine), which is driven by a Westinghouse electric motor, that circulates ammonia through cooling coils. The coils are located in the ice chamber of the refrigerator and connected to the refrigerating machine by piping. The refrigerating ma-



McClellan Electrically Operated Refrigerator.

chines are made in five sizes. The sizes run from one-fifteenth-ton machine, the equivalent of melting 133 pounds of ice per 24 hours, to a one-ton machine, the equivalent of melting 2,000 pounds of ice in 24 hours.

There are no complicated parts to this refrigerating machine, and it is said that a child can start it and shut it off as easily as drawing water from a faucet. A simple turn of a water valve handle starts or stops it, or if desired, the operation of the machine may be controlled automatically, starting and stopping being controlled by the temperature obtaining in the ice box. Ice-making, ice-cream-freezing, and water-cooling equipment may also be obtained as additional features, when required.

With the McClellan system refrigeration is accomplished at from one-half to one-third the cost of ice. If run from five to eight hours a day it is possible to maintain a temperature of 40 degrees or lower in a well-insulated refrigerator of 30 cubic feet, it is said, at a cost of $1.50 a month, as compared with an ice-melting equivalent of from $5 to $7.

This system is adapted to all conditions, and can be attached to almost any ice box, making ideal refrigeration possible for homes, markets, stores, restaurants, hotels, hospitals and clubs. There is no moisture as with ice. The moisture and odors thrown off by the food are taken up, condensed and frozen to the brine tank or pipe coils, keeping the air dry. The result is a uniformly dry temperature, an entire elimination of all germs thrown off by the food, as well as prevention of germ development. In other words, sanitary and hygienic refrigeration is obtained, which keeps products as long as it is desired to keep them, without spoilage and consequent waste.

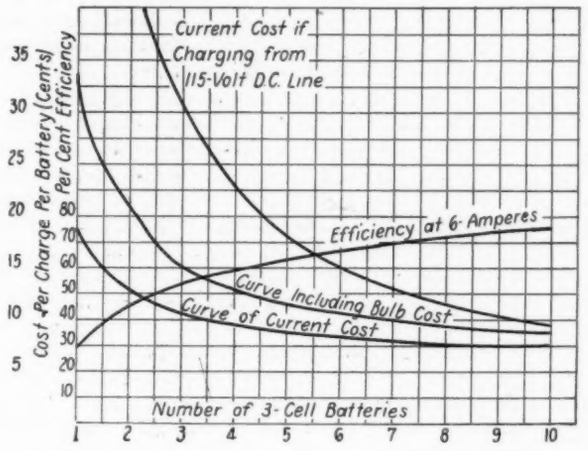
The New General Electric "Tungar" Rectifier for Battery Charging.

Included in the General Electric Company's exhibit at the New York Automobile Show next month there will be shown for the first time three types of the recently perfected "Tungar" rectifiers for changing the alternating current usually supplied on commercial circuits into the direct current necessary to charge storage batteries.

"Tungar" rectifiers were developed as the result of a real need for automobile starting, lighting and ignition batteries. All storage batteries should be recharged at times and in the cold weather the demands are particularly frequent because temperature, excessive use of the starter, lights and horn and the less numerous and shorter periods during which the generator is recharging, all combine to necessitate the application of current from an outside source.

These rectifiers have a range of capacity that extends from the requirements for motorcycles to those of an automobile service station (from 2 to 6 amperes and from 7.5 to 75 volts).

The "Tungar" operates on a new principle for rectifiers. The discovery that made it possible is the perfection of a small bulb, similar to that of an incandescent lamp, in which rectification of the current takes place. This bulb



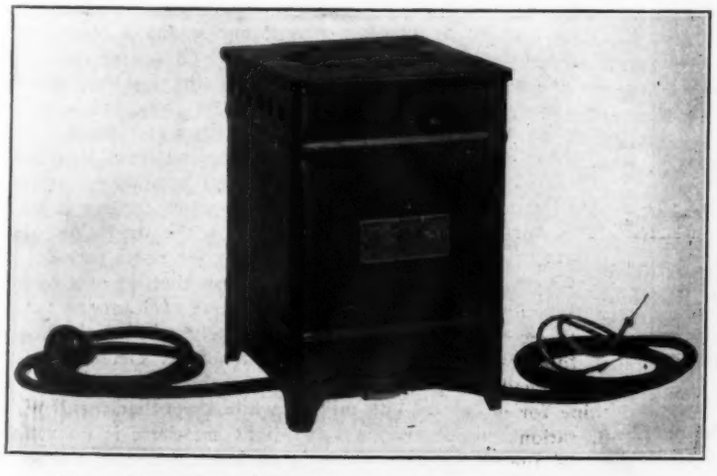
Characteristic Curves of New "Tungar" Rectifier.

is filled with an inert gas and contains a tungsten filament and a graphite anode. It screws into a lamp socket in the outfit. These bulbs are inexpensive and good for hundreds of hours of service.

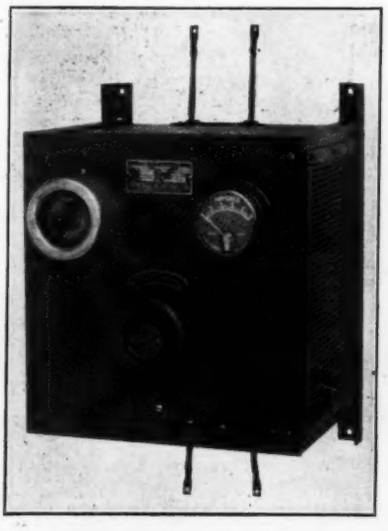
A black japanned casing with perforated top furnishes the mounting and encloses all live parts. This casing carries the bulb, a fuse to protect against reversal and other overload, and the compensator which reduces the alternating current without wasteful resistance and excites the tungsten filament.

For charging, the rectifiers need only be connected to a convenient lamp socket and the pair of leads attached to the proper posts on the battery. In the public garage type the desired voltage must be set also.

The smallest "Tungar" outfit is of two amperes maximum capacity. From a 115-volt, 60-cycle circuit it will charge three lead battery cells at two amperes, six cells at about one ampere, and eight cells at three-fourths of an ampere. Between these figures the charging rate is proportionate. The maximum limitation is 125 volts, at which



"Tungar" Rectifier for Portable Use in Battery Charging.



"Tungar" Rectifier for Stationary Mounting.

it charges with a slight increase in current output. At the minimum of 105 volts, the current output is slightly lower. At 10 cents per kilowatt-hour for energy, the cost is about one cent per hour, including tube-renewal costs. The weight is about eight pounds.

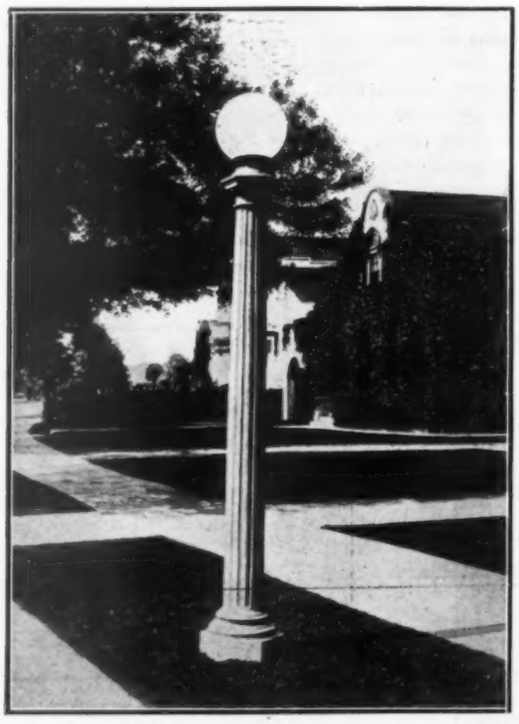
Medium-size "Tungar" rectifiers have a capacity of six amperes at 7.5 to 15 volts and are designed primarily for charging three-cell or six-cell automobile starting and lighting batteries in home garages. This type is designed for 115-volt, 60-cycle current, but may be used on 105 to 125-volt circuits. The weight is about 15 pounds.

The largest type of "Tungar" is designed for use in public garages and service stations and has a capacity of six amperes, at 7.5 to 75 volts. It will charge from one to ten three-cell storage batteries from a 115-volt, 60-cycle circuit. A compensator with 15 taps is part of the device, also a dial switch for instantly adjusting the voltage according to the number of batteries to be charged. The amperage can be regulated between limits of one and six amperes. A single three-cell battery may be charged by itself or any number up to, and including, 30 cells. The controlling devices including ammeter, switch and regulating handle are located on the front of the case. If the alternating current should be interrupted, the batteries cannot discharge, but will start charging again when the current comes on again.

Artistic Single-Lamp Standards for Street Lighting.

Single-lamp standards of the type illustrated herewith are having a great vogue in Los Angeles and other communities in the southern part of California and constitute striking evidence of the growth of the artistic spirit in street lighting.

The standards are of Marbelite made by the American Con-



Artistic Lamp Standard on "Wilshire Boulevard, Los Angeles.

crete Products Company, Los Angeles, Cal. The lamp is inclosed in a Moonstone plain ball made by the Jefferson Glass Company, of Follansbee, W. Va. The balls were personally selected by President Landwehr, of the Concrete Products Company, and will be used on an extensive installation of this type on Wilshire Boulevard in Los Angeles, which is said to be one of the most attractive residence streets in the world.

These standards and balls have proved to be a most efficient lighting unit and this fact, coupled with their artistic merit, promises a widespread popularity for this type of street illumination.

Electrical Equipment of the Strand Theater at Evansville.

In the Strand Theater, the city of Evansville, Ind., has a photoplay house of which it has just cause to be proud. In its interior appointments and class of pictures shown

Interior of Strand Theater in Evansville.

it is the equal of the best theaters in the country. There is a special stage setting which cost $1,500, flowers being used in it for decorative purposes. The foyer is flanked by marble stairways. An electric fountain surrounded by flowers and backed by a large mirror is also located in the foyer. The music is furnished by a $10,000 "Fotoplayer." This theater is operated by the Standard Amusement Company, and great credit is due to its manager, R. R. Russell, for the high class and careful selection of pictures shown. The theater has a total seating capacity of 1,500 on its three floors.

The screen is 13 by 17 feet, and the projection distance 74 feet. Two projectors are used, as very few single-reel subjects are thrown on the screen. The operating booth is located on the first floor, level with the screen. It is made of concrete and is absolutely soundproof. A 4.12-kilowatt, two-light, Westinghouse motor-generator, used for converting alternating current to direct current at 75 volts, is located in the operating booth. This set consists of an alternating-current motor and a direct-current generator. The motor is rated at 7.5 horsepower. It is operated by current furnished by the lighting company. The generator delivers current at 75 volts, but as only 55 volts at the arc is required the generator voltage is reduced to this value by means of non-inflammable, well ventilated resistors, having a sufficient number of steps for adjustment purposes. The motor-generator set is capable of furnishing sufficient current for the operation of two projection machines simultaneously for short periods. The object in using a two-light set is so that when a multiple-reel picture is being run, the second reel can be faded in on a second machine simultaneously with the fading out of the first reel on the first machine, etc. This is accomplished by warming up the carbon on the second machine for about one minute while the other machine is in operation. By using a two-light set there is no variation in voltage, so that there is no interruption to the picture, nor, in the case of a motor-driven picture machine, is the speed altered.

INDUSTRY ACTIVITIES

Estate Stove Company, Hamilton, O., manufacturer of electric ranges, has issued an illustrated folder on electric cooking.

International High-Speed Steel Company, New York City, manufacturer of high-speed steel, tool and metal alloy steels, has issued an attractive booklet on the manufacture of its products.

James G. Biddle, 1211 Arch Street, Philadelphia, Pa., is sending to the trade a mailing card on its "Luxomoter," a portable photometer which gives readings directly in foot-candles. The "Jagabi" hand tachometer is also described.

Beaudry & Company, Incorporated, Boston, Mass., has just issued a 16-page booklet on its "Champion" and "Peerless" power hammers. Several pages are devoted to specifications and useful data on motor-driven power hammers.

Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago, Ill., has opened a branch sales office at 936 Henry Building, Seattle, Wash., with W. E. Jones, district sales manager for the Pacific Northwest, in charge.

National Tank & Pipe Company, Portland, Ore., has prepared catalog No. 14 on wood-pipe construction. The catalog contains tables and engineering data on pipe lines that should be of value to those interested in such construction.

Import Sales Company has appointed G. D. Bernhardt manager of its branch office at 180 North Dearborn Street, Chicago, Ill. The company manufactures flashlight cases, bulbs, batteries, tree-lighting outfits and automobile lamps and is in a position to make deliveries on short notice.

Lapp Insulator Company has been incorporated by John S. Lapp and others with a capitalization of $150,000. The company has acquired a site in Le Roy, N. Y., and will erect a factory for the manufacture of electrical apparatus and insulators for transmission lines and other purposes.

General Electric Company, Schenectady, N. Y., has issued bulletins No. 48,702 and No. 48,703, on Fabroil gears, first known as cloth pinions. The former bulletin illustrates a number of applications of the gears, while the latter bulletin gives a description of the construction with tables showing sizes manufactured. The company has also issued bulletin No. 49,300, on armored cables, a number of styles for use under various conditions of energy transmission being described.

The Sothman Corporation, 40 Exchange Place, New York City, has been formed to undertake enginering construction work. It is also prepared to negotiate the sale of plants, processes and devices. This new company is the outgrowth of the consulting work of P. W. Sothman & Company, well known for its work in designing power plants, electric transmission lines, etc., as many clients of the consulting firm have desired that the same management should be extended to cover construction work.

The Wilson Welder & Metals Company, Incorporated, of New York City, has issued catalog No. 1, which is a substantially bound and well prepared book on the subject of electric welding. The equipment of the Wilson system is described and valuable data given upon the subject of welding and other related matters. Many illustrations are given of parts which have been successfully welded and typical costs are given for carrying out this work. The results of tests of electrically welded joints are also reported. The inclusion of blueprints in a bound volume of this kind is a novelty.

Crocker-Wheeler Company, Ampere, N. J., has prepared folders on the applications of its motors, for distribution by dealers.

Davis Lighting System will be the name under which the business of the American Lighting Company will be conducted after December 31. The former company will maintain offices at 1422 West Randolph Street, Chicago, Ill.

General Bakelite Company, 100 William Street, New York City, has prepared a 28-page booklet entitled "Bakelite on the Automobile," which gives examples of its uses on ignition, starting and lighting apparatus, radiator caps, steering wheels, etc.

Faries Manufacturing Company, Decatur, Ill., has prepared a folder for distribution by the trade descriptive of its lines of desk and table lamps. Another folder on the Faries adjustable telescoping floor portable lamp is also being distributed.

Quick-Heat Appliances Company, 180 North Dearborn Street, Chicago, Ill., is placing a low-priced upright electric toaster on the market, and is able to make immediate deliveries. The company intends to add to its line of electrical appliances soon. It will send catalogs on request.

W. R. Ostrander & Company, 371 Broadway, New York City, have issued a catalog of school signalling appliances, which include strap keyboards, batteries, fire-alarm boxes, bells and other accessories. Specifications for school fire alarms and other signalling systems have been prepared as a supplement to the catalog.

The T. M. Partridge Lumber Company, Minneapolis, Minn., producer of cedar poles, has found it necessary, owing to its constantly increasing business, to enlarge its offices. The company has rented additional floor space adjoining its present offices on the seventh floor of the Lumber Exchange, which will enable it to handle its business with greater facility.

Luminous Unit Company, St. Louis, Mo., is pleased with the reception that its Brascolite semi-indirect lighting units are receiving in China. A considerable number of these efficient fixtures have been installed in various parts of China and throughout the Orient. An interesting installation of Brascolites has been made in the Chinese Headquarters and permanent exhibit of the International School of Correspondence, Shanghai, China. Not only are American and European firms in China using these fixtures, but also an increasing number of native business houses. An interesting editorial on these units appeared recently in the *China Press* published in Chinese in Shanghai.

Electric Vehicle Featured at Boston.—A fine display of handsome Rauch & Lang broughams is being held at the salesrooms of Nicholas Rommelfanger, Boston distributor of this make of electrics. The carriages are the last word in artistic design, being conspicuous for their attractive lines and for beauty of appointment. Mr. Rommelfanger is an acknowledged expert in installing and repairing vehicle batteries, and has an up-to-date service station equipped with every modern requirement for the prompt and efficient handling of his business. A special appeal is being made to feminine users and operators of automobiles, it being pointed out that the electric is the ideal woman's car on account of ease of operation and simple control. The 1917 Detroit electrics being displayed by

E. Y. Simpson, the local distributor, are similar to former models, except model 68, which is entirely new. This vehicle is $500 cheaper than any Detroit brougham of last year. It is slightly smaller and lighter, and some extravagant equipment is absent. A reduction in the size of tires is possible through the car being lighter. The profit to the manufacturers is pared down, and the cost of production has been reduced by manufacturing in large quantities on standard specifications. The outlook for sales of electrics in Boston is considered very bright.

Deuth & Company, Incorporated, 120 Broadway, New York City, has announced that it is in excellent position to sell or place any kind, quality or quantity of electrical devices. Its direct connections with domestic and foreign buyers and consumers of such articles, together with a considerable number of correspondents in all European countries, and exceptional facilities in the way of shipping and banking, places the concern in an advantageous position for offering its services to the trade.

National Metal Molding Company, Pittsburgh, Pa., is mailing out to the trade reprints of an article dealing with the use of Sherardized iron money in Germany, of which a considerable amount has been placed in circulation. The following is quoted from the *Elektrotechnische Zeitschrift* (Berlin): "The use of iron, or rather, of steel was possible only on condition that the metal should be protected from rust by a process at once efficacious and economical. Among the many methods tested, the one selected was Sherardization, so called from the name of the inventor, Sherard D. Cowper Coles. This, which is both durable and cheap, consists in placing the articles to be treated, in this case disks of steel not yet stamped, inside a receptacle filled with powdered zinc. The whole is then heated and kept for a certain length of time at a temperature slightly lower than that of the fusion of zinc. A protective alloy is thus formed on the surface of the disk sufficiently tenacious to undergo stamping without cracking and very resistant to rust."

Progress of the Utilities Indemnity Exchange

CO-OPERATION is accomplishing some remarkable results in the matter of insurance for electrical companies, just as it has brought about most important achievements wherever undertaken in other fields of electrical endeavor. The necessity for making proper provision for various kinds of insurance is rapidly being appreciated by all electrical interests. To carry this insurance in the regular stock insurance companies, however, has in most cases been found expensive by electrical companies, because in the regular insurance channels the risks of electrical concerns are usually assumed to be much greater than they actually are found to be. From this fact developed about five years ago a movement for the formation of a co-operative or reciprocal insurance organization to handle the insurance of electrical companies. This organization, known as the Utilities Indemnity Exchange, with headquarters in St. Louis, Mo., has been making steady progress since its beginning and has recently broadened its activities so as to still further increase its usefulness to the several branches of the electrical industry.

Lynton T. Block.

With the passage of workmen's compensation laws in many states, the provision for liability insurance became an urgent matter a few years ago and the Utilities Indemnity Exchange consequently undertook at first only this branch of insurance for its electrical members. The all-around satisfaction with which this insurance was handled by the Exchange and especially the economy in the net premiums as compared with those of the old stock insurance organizations resulted in a rapid increase in the membership and the broadening of the lines of insurance taken care of. The extension of liability insurance from indemnity to employees of utility companies to indemnity for accidents to the public followed soon after organization. Fire insurance was also undertaken and has been handled for several years with equal success. About a year ago automobile liability insurance was assumed for electrical interests and a few months ago there was undertaken insurance against property damage to the public in general.

This latter is a kind of insurance that has not yet been available through any other insurance medium. It covers such cases as injury or death to horses or other domestic animals from contact with fallen live wires or stumbling over fallen poles or into unguarded excavations, manholes, etc.; property damage by fire due to neglect of an electrical company is another of the varied cases provided for by this kind of insurance, which is proving to be a very successful new line.

In all of the insurance activities of the Exchange the idea is kept in mind of giving the best possible service to its members. This means prompt and courteous settlement of claims for damages, avoidance wherever possible of litigation with its prolonged delays, burdensome costs and bitter animosities, and conducting the insurance for members at a minimum cost. This general policy, carried out from the first, is accountable for the satisfaction felt by all members of the Exchange, who realize that through it only can they obtain a thoroughly reliable insurance service of the kind needed by electrical companies at an economical outlay.

In the matter of low cost of dependable insurance the Utilities Indemnity Exchange has made an enviable showing. At the recent telephone convention in Chicago it exhibited an array of 26 closely typewritten pages containing a list of liability insurance policy holders to whom checks for savings aggregating close to $65,000 had been sent. Over a period of several years it has been found that in this branch of the business the savings average from 25 to 40 per cent of the usual premium. In the fire-insurance department they average from 35 to 50 per cent; this latter department has greatly increased its business during the last half year. Including all its various insurance lines, the business of the Utilities Indemnity Exchange has increased from 50 to 60 per cent this year as compared with last year.

The steady progress of the Exchange and its excellent showing of savings and satisfactory service to its members are due in no small degree to the enterprising and yet conservative management of the Exchange, at the head of which is Lynton T. Block, its attorney and manager.

The Exchange has been investigated by several state and national electrical central-station, telephone and contractors' associations and fully endorsed as a medium for securing safe and economical insurance.

PERSONAL AND BIOGRAPHICAL

MR. JOSEPH STEWART, of Pueblo, Colo., has been appointed general manager of the Grand Junction (Colo.) Electric, Gas & Manufacturing Company.

MR. E. L. SELLERS, general manager of the Kentucky Public Service Company of Frankfort, Ky., has been promoted to the position of manager of the Oneonto (N. Y.) Light & Power Company.

MR. W. A. WINTERBOTTOM has been appointed division superintendent of the Alaska circuits of the Marconi Wireless Telegraph Company. MR. T. M. STEPHENS has been appointed marine superintendent, and MR. H. BARTH division engineer for the Pacific Coast.

MR. WALTER BELDING, who has been associated with the Rutland (Vt.) Railway, Light & Power Company, has resigned his position as superintendent to accept the managership of the municipal electric plant at Burlington, Vt., succeeding MR. L. R. MAC BROOM, resigned. Mr. Belding has been in the employ of the Rutland company since his graduation from the University of Vermont in 1911.

DR. CHARLES A. LAUFFER, medical director of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently delivered before medical societies, safety-first and welfare conferences a series of papers dealing with disease and accidents in industrial plants that have been favorably commented upon by the medical profession. Among these papers is one on the subject of "Sickness Versus Accident" in which the author draws conclusions on the tendency of the employee to attribute ailment to accident rather than to sickness, thereby making a company liable for compensation damages which would not be the case if the ailment was due to sickness.

MR. E. W. P. SMITH, who has been city electrician at Cleveland, O., for the past three years, has resigned to accept the position of consulting engineer with the Elliott Electric Company, 322 Champlain Avenue, Cleveland. He will assume his new duties January 1. Mr. Smith was graduated in electrical engineering from Colorado College, Colorado Springs, in 1908. After a year of operating experience in the West, he entered the employ of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, in the railway engineering department. Mr. Smith was later employed by the City of Cleveland, in the smoke prevention division, where a preliminary report on the electrification of steam railroads in Cleveland was prepared. During the latter part of 1913 he was in the mechanical department of the Lake Shore & Michigan Southern Railroad. Early in 1914 he was appointed city electrician of Cleveland. During his term of office, a revision of the electrical code was prepared, which has been passed by the Council. Mr. Smith is chairman of the Cleveland Section of the American Institute of Electrical Engineers, a member of the Chamber of Commerce, the Jovians, the Electrical League and the Cleveland Engineering Society.

MR. PAUL LUPKE, formerly superintendent of the southern division of the Public Service Electric Company, Trenton, N. J., has been appointed general superintendent of the company, with offices at Newark.

MR. P. A. STAPLES, formerly vice-president and general manager of the New Jersey Power & Light Company, Dover, N. J., and second vice-president of the Sandusky (O.) Gas & Electric Company, has been elected vice-president and general manager of the Binghamton (N. Y.) Light, Heat & Power Company, succeeding S. H. Dailey, who has been made general manager of the public utilities operating in Lexington, Ky.

MR. WILLIAM A. DURGIN, lighting engineer of the Commonwealth Edison Company, of Chicago, Ill., gave an illustrated talk before a meeting conducted by the Civic-Industrial Committee of the Chicago Association of Commerce on December 8 at Chicago. Mr. Durgin's subject was "Modern Lighting," and he pointed out the developments made in illumination, and how, by proper control, better than average results can be secured.

MR. GEORGE C. KEECH, Chicago sales manager of the Cooper-Hewitt Electric Company, made an address on December 22 before the Detroit-Ann Arbor Section of the American Institute of Electrical Engineers on "Lighting and Production." Mr. Keech emphasized the importance of adequate lighting in its relation to production and exhibited lantern slides of Detroit factories equipped with mercury-vapor lamps. The manager of one of these factories, which operates 24 hours per day, had testified that since the new lighting equipment was installed the rate of production at night had been maintained at the same value as during daylight hours. This has been noted especially in progressive assembling operations.

MR. EMIL A. BECHSTEIN, for a number of years general manager of the Sandusky (O.) Gas & Electric Company, has been elected second vice-president of that company, succeeding MR. P. A. STAPLES. Mr. Bechstein is president of the Ohio Electric Light Association.

E. A. Bechstein.

MR. JAMES B. TAYLOR, superintendent of the Quakertown, Pa., municipal electric-lighting plant, has resigned.

OBITUARY.

MR. WALTER C. EDSON, of the W. C. Edson Company, Boston, Mass., manufacturer of electric lighting fixtures, died at his home in that city December 12, aged 47 years.

MR. GEORGE M. ROSSMAN, prominent in the electric-lighting industry in New Hampshire, died at his home in Keene, N. H., December 10 at the age of 45 years. He was treasurer of the Laconia Gas & Electric Light Company, treasurer and manager of the Keene Gas & Electric Company and treasurer of the Greenfield Gas Light and the Ashuelot Gas & Electric companies.

MR. FREDERIC H. REED, first vice-president of J. G. White & Company, died in New York City December 9, aged 51 years. He was very prominent in the electric-railway field, having designed and installed systems for a number of American cities. Mr. Reed was connected with J. G. White & Company since 1899 and served as a director for many railway and lighting companies operated by that concern.

MR. JOHN W. McNAMARA, superintendent of underground lines for the Detroit Edison Company, who died December 12, was one of the oldest employees of the company, having served 27 years in various capacities. He was born in Detroit in 1868 and lived there the major portion of his life. Mr. McNamara was rated as one of the best authorities on the construction and operation of underground steam and electric lines in this country and was noted for the superiority of his work, due to intelligent planning and supervision.

MR. EDGAR JUDSON MOCK, president of the Electricity Magazine Corporation, publisher of *Telephone Engineer*, *Electric Vehicles* and *Motography*, died December 18 at his home in Chicago, Ill., after an illness of several months. During the greater part of this year Mr. Mock had been unable to take an active part in the affairs of his concern because of sickness. An executive of rare ability, he organized his interests so that his policies will be continued by his successor. Mr. Mock was born March 26, 1870, at Fort Wayne, Ind. He was publisher of the Alma (Neb.) *Weekly Record* and later the Hastings (Neb.) *Daily Record*, and in 1898 became superintendent of the Western Newspaper Union at Omaha, Neb. In 1902 he became business manager of Telephony Publishing Company, Chicago, resigning five years later as secretary-treasurer. He purchased *Sound Waves*, a telephone trade paper, and later disposed of it to other interests. In 1908 he organized the Electricity Magazine Corporation and was its president and treasurer for eight years. His widow, a sister and two brothers survive him. Mr. Paul H. Woodruff, for several years editor of the corporation's publications, will continue in charge of them.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

SOUTH BERWICK, ME.—The Berwick & Salmon Falls Electric Company has made application to the Public Utilities Commission for authority to issue bonds to provide funds for a hydroelectric development it is planning to make.

BETHLEHEM, N. H.—The Bethlehem Electric Light Company is making an extension of its distribution system to furnish service to the town of Jefferson, N. H.

DOVER, N. H.—The Twin State Gas & Electric Company is preparing plans for the construction of a hydroelectric plant at Milton, costing about $25,000. The company will furnish service in Milton Mills and Union.

RUTLAND, VT.—The water rights and buildings on East Creek owned by W. C. Leonard, proprietor of the Glen Mill, two miles north of this city, have been bought by the F. R. Patch Manufacturing Company, of Rutland, which is planning the installation of a power plant.

WINCHENDON, MASS.—The Winchendon Electric Light & Power Company is making a number of transmission-line extensions.

CUBA, N. Y.—The Cuba Electric Company is planning to erect a transmission line to Rushford to furnish service there.

ROCHESTER, N. Y.—The Main Street East Improvement Association is considering plans for the modern lighting system in Main Street between University Avenue and Goodman Street.

MAPLEWOOD, N. J.—The Township Committee has approved specifications for the installation of a police telegraph system.

DENVER, PA.—The Denver Street Railway Company has been chartered with a capital stock of $130,000. The new company will build a trolley line from Denver to Ephrata, a distance of five miles. At Ephrata the road will connect for Lancaster. H. S. Distler, of Denver, is president of the company.

NORRISTOWN, PA. — The Perkiomen Valley Traction Company has been granted a franchise by the State Commission to build a new line from Collegeville to Greenland, along the state highway. Construction of a line has been commenced between Collegeville and Schwenkville, paralleling the Perkiomen branch of the Philadelphia & Reading Railway.

PHILADELPHIA, PA.—The Philadelphia Electric Company has awarded a contract for the erection of an edition to its building at Tenth and Chestnut Streets to John R. Wiggins Company.

FRANKLIN, VA.—The city will issue $40,000 in bonds for improvements to the local electric-lighting plant. W. O. Bristow is Finance Commissioner.

HARRISONBURG, VA.—A syndicate of New York and Washington financiers is promoting an electric railway line from Baltimore through Washington and Harrisonburg to Staunton and Waynesboro, a distance of 200 miles.

PETERSBURG, VA.—The City Council has made an appropriation for improvements to the local electric-lighting system.

VERO, FLA.—The Vero Electric Light & Ice Company has been organized by N. J. Norman and others. An electric-lighting plant will be established here.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company, of Akron, the operating subsidiary of the Northern Ohio Electric Corporation, has applied to the Ohio Public Utility Commission for authority to issue $1,000,000 common stock at par, the proceeds to be used for construction work and extension. Northern Ohio Electric Corporation owns over 95 per cent of the present outstanding common stock of Northern Ohio Traction & Light, and the new stock will be taken by the holding company.

CLEVELAND, O.—The Public Utilities Commission has authorized the sale of the Rocky River Water, Light & Power Company to the Cleveland Electric Illuminating Company for $4,000.

MIDDLETOWN, O.—The Ohio Gas & Electric Company is now making arrangements for the erection of a high-tension transmission line from Cincinnati to Hamilton and this city, for the purpose of transmitting energy from the new plant of the Union Gas & Electric Company at Cincinnati, which will be completed next June. The energy will be distributed in Hamilton and Middletown for private consumption, the distribution in Hamilton to be made through the Hamilton Utilities Company.

MILFORD, O.—At a meeting of the officers of the Little Miami River Light & Power Company, J. W. Hill, consulting engineer, outlined plans for hydroelectric development on the Little Miami River to furnish light, heat and power in this section. Louis Dolle, Mercantile Library Building, Cincinnati, is interested.

MOUNT GILEAD, O.—The Hydraulic Press Manufacturing Company, of which Frank B. McMillan is manager, will make extensions to its power plant.

VAN WERT, O.—Application has been made by the Northwestern Ohio Light Company of this city for an order to acquire the property of the Mechanicsburg Light & Power Company. Application also was made for a right to issue $12,000 first-mortgage bonds.

MONGO, IND.—The Farmers & Merchants Light & Power Company has been incorporated with a capital of $500,000 to furnish electrical energy for light, heat and power in this vicinity. The incorporators are Hiram Himebaugh, J. L. Hawk and E. Z. Hawk.

NOBLESVILLE, IND.—The Noblesville Heat, Light & Power Company has increased its capital stock from $100,000 to $250,000.

ALBION, ILL.—The Albion Electric Light Company, L. F. Campbell, manager, will purchase additional machinery.

DAWSON, ILL.—The Illinois Traction System, operating under the name of the Illinois Consumers' Electric Company, has applied to the Illinois State Public Utilities Commission for permission to supply electric service here.

SPRINGFIELD, ILL.—A. D. Mackie, general manager of the Springfield Utility Company, has submitted to the city a proposition for the placing of overhead wires in conduit, the latter to be owned by the city and to be leased by the public service companies. It is estimated that the installation of such a system would cost $390,000, of which the expense of placing the Springfield Utility Company's wires underground would be $200,000.

IRON RIVER, MICH.—The contract for street lighting held by the Iron Range Light & Power Company expired December 12. The Council has not renewed the contract.

BELOIT, WIS.—An ornamental lighting system for the business section of the city furnished one of the chief topics of discussion by members of the Beloit Business Men's Association at a recent meeting.

MERRILL, WIS.—The Common Council has accepted plans prepared by A. J. Sweet, consulting engineer Milwaukee, Wis., for an ornamental lighting system for the business district.

MILWAUKEE, WIS.—The Line Material Company, of South Milwaukee, has been awarded a contract to furnish 3,700 lamps for the municipal lighting system on its bid of $21,860.

RIVER FALLS, WIS.—The city contemplates the installation of a white-way system in the spring.

STEVENS POINT, WIS.—The Wisconsin Valley Electric Company has made arrangements with the Whiting-Plover Paper Company whereby the power plants of the two companies will be connected with a transmission line for the exchange of power. The latter company has available at the present time a considerable amount of generating equipment and the electric company will use the surplus to take care of the additional demand being made on its system.

WAUPACA, WIS.—The Waupaca Electric Service & Railway Company contemplates a number of improvements to its power plant.

BROOK PARK, MINN.—The Eastern Minnesota Power Company, of Pine City, of which R. P. Allen is manager, is planning to install an electric-lighting system.

EVELETH, MINN.—The city contemplates the installation of two electrically-driven pumps of 1,000,000-gallon capacity.

LITTLE FALLS, MINN.—The Little Falls Water Power Company has extended its transmission lines to the town of Long Prairie, where it will furnish electric service. Besides Little Falls and Long Prairie, the company is furnishing service in Pierz and Royalton, and is planning to extend its lines to Wadena, Verndale and Randall. T. C. Gordon is manager of the company.

MINNEAPOLIS, MINN. — The Northwestern Telephone Exchange Company will spend $5,000,000 for new construction in 1917, according to an announcement made by C. E. Yost, president. The amount is to be expended in the Twin Cities.

ROCHESTER, MINN.—The Rochester Utility Company has been incorporated at Fort Wayne, Ind., with a capital of $400,000, to operate local public utilities. The incorporators are L. F. Ryall, C. A. Runyan and Frank Wheeler.

BURLINGTON, IOWA.—The Burlington Railway & Light Company has received permission from the Railroad Commission to make extensions to its transmission lines in Louisa and Des Moines Counties.

MAQUOKETA, IOWA.—The Iowa Electric Company will make improvements to the local electric-lighting system.

TORONTO, IOWA.—The City Council has made an appropriation for street-lighting equipment.

WEBSTER CITY, IOWA.—Bids will be received in January for improvements to the electric-lighting and water systems. About $18,000 will be expended. H. G. Volmer is City Manager.

FULTON, MO.—The Fulton State Hospital has asked the Legislature for an appropriation for the installation of a new power plant.

JEFFERSON, MO.—Preliminary surveys have been made by interests connected with Illinois Traction System, it is reported, for the construction of an electric railway from Jefferson City to Mexico, Mo., by way of Fulton, a distance of about 45 miles. H. E. Chubbuck, Peoria, Ill., is general manager of the Illinois Traction System.

JOPLIN, MO.—The city contemplates voting $175,000 bonds to construct an electric-lighting and ice plant.

NEWTON, MO.—The city contemplates voting on bonds to construct an electric-lighting plant.

McCRACKEN, KANS.—Ways and means are being considered by the City Council for securing electric service here. A distribution system will probably be erected and energy secured from a neighboring town.

MORAN, KANS.—Bids are being received by F. W. Young, City Clerk, for the installation of electric-lighting and water systems, estimated to cost $4,200.

SALINA, KANS.—The Salina Light, Power & Gas Company will make the addition of a 2,500-kilowatt generating unit to its power plant, according to the announcement by Manager Harsh.

ODELL, NEB.—The local electric-lighting plant, owned by James Barry and which was destroyed by fire recently, will be rebuilt.

OMAHA, NEB.—The proposition to establish a municipal electric-lighting plant in this city was defeated at a special election when the voters approved a five-year street lighting contract with the Omaha Electric Light & Power Company. According to the terms of the contract the city will have 1,071 additional lamps and the old arc lamps will be replaced by 400-candle-power incandescent lamps. The installation of an extensive ornamental lighting system will be made in the down town district. Under the contract the city will have 261 twin unit ornamental lamps, 71 single unit lamps and 1,895 overhead units. G. H. Harris, president of the Omaha company, stated that his company will expend $100,000 in new equipment made necessary to carry out the contract.

WINSIDE, NEB.—An election will be held to vote on a bond issue of $7,500 for the establishment of an electric-lighting plant.

BOWDON, N. D.—The local electric-lighting plant was destroyed by an explosion, causing a loss of $2,500.

PORTLAND, N. D.—The City Council has authorized a bond issue of $2,000 for the erection of an electric-lighting system.

WINFRED, N. D.—The Town Trustees have awarded a contract to the Northern Electric Company, Minneapolis, Minn., for the installation of a local street-lighting system and a transmission line to Howard.

ZAP, N. D.—The Zap Electric Light & Power Company will install a 30-horse-power engine in its local plant.

SOUTH CENTRAL STATES.

ASHLAND, KY.—The Boyd County Electric Company, of this city, has increased its capital stock from $32,000 to $155,000.

LEXINGTON, KY.—The Western Union Telegraph Company proposes an underground wire system in Lexington and has asked Commissioner McCorkie for permission to make the change.

MURRAY, KY.—An ordinance providing for the issue of bonds for the purpose of constructing, operating and maintaining a municipal electric light and power plant and to improve on the present system of water works has been drawn up. The bonds will be issued to the amount of $20,000.

BRISTOL, TENN.—The properties of the Bristol Traction Company, including the electric railway lines in Bristol, have been placed in the hands of Fred Dulaney and J. A. Caldwell as receivers.

MEMPHIS, TENN.—The Memphis & Rugby Railroad Company, of Memphis, will install a new power house at Rugby Park.

EARLE, ARK.—The local electric-lighting plant was destroyed by fire recently.

BARTLESVILLE, OKLA.—The Caney Valley Electric Light Company has been incorporated with a capital of $5,000. W. H. Bryan is manager.

NORMAN, OKLA.—As the first steps towards acquiring a municipal electric-lighting plant for Norman, Mayor Lindsay has appointed Benjamin H. Barbour, Thomas Vincent, C. A. Richards and M. F. McFarland a committee to investigate the cost and operation of municipal plants in other cities of the state.

OKLAHOMA CITY, OKLA.—The Southwestern Power, Light & Railway Company, 406 Security Building, will issue about $1,000,000 in bonds for construction of hydroelectric plants on Washita River, and contemplates furnishing electricity to Ardmore, Oklahoma City, Shawnee and other cities. W. T. Croslen, Oklahoma City, is consulting engineer.

ROCKY, OKLA.—An electric-lighting plant, to cost about $2,000, will be installed here.

ALTO, TEX.—The electric-lighting plant of the Alto Light & Power Company, which was recently destroyed by fire, will be rebuilt.

ATLANTA, TEX.—The Atlanta Electric & Ice Company will rebuild its plant, which was destroyed by fire in September at a loss of $30,000.

BROWNWOOD, TEX.—The Texas Power & Light Company, of Dallas, will enlarge its plant here and extend its transmission system to a number of other towns of this section.

GARWOOD, TEX.—J. J. Cooper and associates contemplate the construction of an electric light and power plant here.

GREENVILLE, TEX.—The Mineral Heights Street Railway Company has been incorporated here with a capital of $3,000. J. A. Phillips is a stockholder.

GUSTINE, TEX.—It is reported that W. T. Ball, of Comanche, Tex., contemplates the installation of an electric-lighting system here.

HOUSTON, TEX.—The Texas Company, of Houston, is considering plans for the construction of a large electric power plant in Tampico, Mexico, with the object of furnishing power for operating the oil pipe line pumping plants and other machinery and equipment connected with its own oil industry and that of other large concerns. The proposed power transmission system will extend to all the oil fields in the Gulf Coast region of Mexico.

MABANK, TEX.—The installation of a municipal electric-lighting system is contemplated here.

MART, TEX.—The Mutual Electric Company has been granted a franchise by the City Commission to build an electric light and power plant here. Lee Harlan is a stockholder.

SAN ANTONIO, TEX.—The City Commission plans to install an electric police-signal system here, to cost about $50,000. It will involve the installation of about 30 stations.

DATES AHEAD.

American Association for the Advancement of Science. Annual meeting, New York City, December 26-30. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

American Institute of Chemical Engineers. Annual convention, New York City, January 10-13, 1917. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual meeting, Hotel Wisconsin, Milwaukee, Wis., January 15-17. Secretary, Albert Peterman, 626 Lloyd Street, Milwaukee.

Western Association of Electrical Inspectors. Annual meeting, Hotel Secor, Toledo, O., January 23-25. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem., E. A. Thiele, Roswell, N. M.

WESTERN STATES.

LIBBY, MONT.—J. A. Coram, of New York City, is investigating possibilities for establishing a large paper mill in this vicinity. He plans the erection of a hydro-electric plant in connection with the mill.

GLOBE, ARIZ.—The street-railway franchise held by the Globe-Miami Traction Company has reverted back to the city. By the terms of the franchise L. L. Litchfield, president of the company, will receive $1,500, if the franchise is taken up, to reimburse him for money expended.

WILCOX, ARIZ.—The Common Council has granted permission to Neil McMillan to construct an electric light and power plant in this city.

GALLUP, N. M.—The Citizens Light & Power Company has been incorporated here with a capital stock of $150,000. The company is an affiliation of the Gallup Telephone Company and the Gallup Electric Light Company.

COALVILLE, UTAH.—The Phoenix Construction Company is installing a local distribution system for the Utah Power & Light Company, which will furnish service here.

SPRINGFIELD, UTAH.—The City Council is considering propositions from the United States Government plant, situated at the mouth of the Spanish Fork Canyon, and from the Utah Power & Light Company for emergency connections to the city's electric-lighting plant. Both companies propose to furnish electrical energy to the city, but the Council will probably decide to build an emergency plant adjoining its present plant in Hobble Creek Canyon.

CALDWELL, IDAHO.—Governor Alexander and other members of the State Land Board have gone on record as favoring a plan for the state to build a power plant for the use of the Gem district.

LEWISTON, IDAHO.—Negotiations have been completed for the sale by the Lewiston-Clarkston Improvement Company of its electric power plants and irrigation system to the Washington-Idaho Water, Light & Power Company. The latter company was recently organized by Liggett, Hichborn & Company of New York. The consideration was about $800,000. The principal communities served by the company were Clarkston, Wash., and Lewiston.

CLE ELUM, WASH.—Bonds issued for construction of municipal lighting plant at this place have been sold to the amount of $5,000.

SEATTLE, WASH.—The budget for 1917 of the Puget Sound Traction, Light & Power Company provides for an expenditure of about $1,215,000 for extensions and improvements, including new light and power plants, overhead construction, track and trestle work.

KALMATH FALLS, ORE.—A 50-year franchise was granted to the Keno Power Company of this city at a recent election.

BLYTHE, CAL.—B. McCready, of Searchlight, Nev., was in this city recently investigating conditions with a view to establishing an electric-lighting plant here.

BURBANK, CAL.—Work on the new ornamental lighting system to be installed on San Fernando Road through Burbank between Providencia and Cypress Avenues will be commenced soon.

CHICO, CAL.—A plan for a municipal lighting system costing $750,000 has been presented to the Business Men's Association by Denny Murphy. The plan calls for the use of Mr. Murphy's water rights on Deer Creek.

LOS ANGELES, CAL.—Bids have been called for on the contract for lighting Hobart Street between Sixteenth and Washington Streets.

LOS ANGELES, CAL.—The Public Service Commission has approved the $500 bond presented by the city of Pasadena to insure faithful performance of its contract to furnish electrical energy to this city.

LOS ANGELES, CAL.—The Southern California Edison Company has been given a contract to construct a temporary power line of 2,700 feet to connect Belleview Avenue outfall sewer pumps with the company's line near El Segunde.

LOS ANGELES, CAL.—The County Counsel's report on the proposed installation and repair work in the Norwalk lighting district has been referred by the Board of Supervisors to the Chief Mechanical Engineer and the Lighting Committee.

LOS ANGELES, CAL.—The City Council has ordered ornamental lighting posts and appliances for the new lighting system to be installed on Cherokee Avenue between Sunset Boulevard and DeLongpre Avenue and portions of Leland Way.

LOS ANGELES, CAL.—Steps have been taken by the Public Service Commission to stop all construction work of the municipal power system which would be inconsistent with the purchase of the holdings of the Pacific Light & Power Company and the Southern California Edison Company.

MARTINEZ, CAL.—City Manager Don C. Ray has submitted a plan to the Board of Trustees for an electric-lighting system for the entire city.

PASADENA, CAL.—The work on the Mission Street lighting system has been delayed as the resolutions calling for the work were adopted before the time for protest had expired. Proceedings will be started again.

RIVERSIDE, CAL.—The Southern Sierras Power Company has entered into a contract to construct a high-tension transmission line from Elcentro to Hanlon Heading. The line will cost $200,000.

RIVERSIDE, CAL.—The City Electric Supply Company has been awarded the contract for building the power lines, telephone lines and three transformer substations for the Terra Bella Irrigation Project. The amount of the contract is $44,400.

SACRAMENTO, CAL.—Bids for installing electroliers at the front and side entrances to the court house have been asked for by the Board of Supervisors. The plans were prepared by R. A. Herold.

SAN FRANCISCO, CAL.—The application of the Great Western Power Company to extend its power lines into Plumas County is opposed by the Plumas Light & Power Company.

SANTA ANA, CAL.—The San Diego Consolidated Gas & Electric Company has applied to the Board of Supervisors for permission to make a number of extensions to its system.

SANTA BARBARA, CAL.—The Santa Barbara Telephone Company is taking over the properties of the Home Telephone Company of Santa Barbara, the Home Telephone Company of Santa Barbara County and the Pacific Telegraph & Telephone Company in accordance with the approval of the Railroad Commission. Improvements costing $28,000 are planned by the Santa Barbara Telephone Company.

SANTA CLARA, CAL.—An electrolier lighting system costing about $2,500 is contemplated by this city.

New Incorporations

CLEVELAND, O.—DeMooy Electric Company has increased its capital stock from $10,000 to $100,000.

CHICAGO, ILL.—Gardiner Storage Battery Company has increased its capital stock from $150,000 to $1,000,000.

MILWAUKEE, WIS.—Greusel-Quarfot Electric Company has increased its capital stock from $50,000 to $60,000.

MUSCATINE, IOWA.—Muscatine Electrical Construction Company. Capital, $10,000. Incorporator: Forrest E. Downing.

CHICAGO, ILL.—The Electrograph Company. Capital, $20,000. Incorporators: Charles L. Pike, Oscar N. Scherer and H. A. Rice.

CHICAGO, ILL.—Calumet Storage Battery Company. Capital, $25,000. Incorporators: Charles L. Wood, W. L. Coulter and John B. Price.

CHICAGO, ILL.—Bigelow Electric Manufacturing Company. Capital, $5,000. Incorporators: L. Weisskopf, V. O. Appel and E. J. Hennessy.

WHEELING, MO.—The Fuse Electric Fire & Burglar Alarm Company. Capital, $30,000. Incorporators: T. J. Lilly, A. E. Lowe and W. S. Cherry.

ANNISTON, ALA.—Anniston Plumbing & Electric Company. Capital, $10,000. Incorporators: A. L. Kenyon, Columbia, S. C.; G. H. Cress and E. M. Martin, Anniston.

BOSTON, MASS.—Bernard Kapstein Company. Capital, $25,000. Deal in electrical supplies. Incorporators: Joseph Bearson, E. M. Kapstein and E. I. Newstadt.

PHILADELPHIA, PA.—Joseph A. Miller Electric Construction Company. Capital, $10,000. To engage in electrical construction work. M. H. Miller, Philadelphia, treasurer.

DOVER, DEL.—Detroit Gas Turbine Corporation. Capital stock, $2,000,000. To manufacture turbines and other machinery. Incorporators: L. B. Phillips and J. B. Bailey, Dover.

LE ROY, N. Y.—Lapp Insulator Company. Manufacture electrical apparatus, insulating materials, etc. Incorporators: J. B. Abbott, Geneseo, N. Y.; H. W. Ripley and Samuel Levy, Rochester, N. Y.

DETROIT, MICH.—Detroit Closed Fuse Bushing Company. Capital, $15,000. Manufacture closed bushings, electrical and other devices. Incorporators: H. E. Watson, F. M. Hydon and William Short.

New Publications

MAGNETIC STANDARDS.—Scientific Paper No. 295 of the Bureau of Standards is entitled "Determination of the Degree of Uniformity of Bars for Magnetic Standards," by Raymond L. Sanford. It points out the importance of uniformity in bars used for concrete magnetic standards and describes a method and apparatus for testing. Typical results are shown by means of diagrams.

EXPORT TRADE.—The Federal Trade Commission, Washington, D. C., has published a report on "Co-operation in American Export Trade." It is in two parts, the first part containing a summary and a detailed discussion of the character and importance of foreign trade, the competitive conditions to be met, and the co-operation that may be accomplished in particular industries.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 23,236. HYDROELECTRIC INSTALLATIONS.—Two firms in Venezuela have made inquiries regarding turbine water wheels, spiral water pipe, and small electric installations. Correspondence in Spanish.

NO. 23,265. ELECTRIC-LIGHTING FIXTURES.—A man in Spain is in the market for lighting fixtures and other supplies. Correspondence may be in English. References.

Financial Notes

The Detroit Edison Company has under consideration plans to increase its authorized capital stock from $25,000,000 to $35,000,000. Stockholders will be given the privilege of subscribing to the new authorization to the extent of between 10 and 20 per cent of their current holdings.

Upon application of the American Brass Company, Waterbury, Conn., W. C. Tuttle, Jr., has been appointed receiver for the C. & C. Electric Company, Garwood, N. J. The court has issued an order, returnable on December 23, to show cause why the receivership should not be continued. The company has an authorized capital of $500,000, with assets of $325,000, or about $45,000 in excess of current liabilities. The company is unable to realize immediately upon its assets, and therefore cannot meet pressing obligations.

Improved conditions in the South during the past year are indicated in the increased earnings of the Carolina Power & Light Company, which is showing a gain in gross of close to $100,000 a year. The company, which is controlled by the Electric Bond & Share Company, has just declared an initial dividend of one-half of one per cent on its $4,350,000 common stock. It controls the Yadkin River Power Company and the Asheville Power & Light Company, and operates in the growing North Carolina towns of Raleigh, Durham, Goldsboro, etc., serving a population of approximately 145,000 in 16 communities.

Northern States Power Company has declared a quarterly dividend of 1.75 per cent on its common stock, payable January 15 to stockholders of record December 30. This is an increase of one-fourth of one per cent quarterly over the last quarterly declaration. The regular quarterly dividend of 1.75 per cent on the preferred was also declared, payable January 20, to stock of record December 30. Revenues of Northern States Power over the last five years have been showing steady gains, gross and net, for the 12 months ended September 30 being for this period as follows:

	Gross.	Net.
1916	$5,822,703	$3,233,956
1915	4,903,338	2,714,075
1914	4,377,469	2,307,079
1913	3,973,076	2,018,667
1912	3,595,792	1,569,915

Subsidiaries of the Tennessee Railway, Light & Power Company make a somewhat less favorable exhibit for October than for several months. Gross earnings of the Tennessee Power Company amounted to $159,059, an increase of $57,074, or 56 per cent, while operating expenses amounted to $113,932, an increase of $63,625, or 126.5 per cent, and the balance amounted to $13,963, a decrease of $5,293. Gross earnings of Chattanooga Railway & Light were $109,024, an increase of $10,869, or 11.1 per cent, and net earnings lacked $3,098 of covering fixed charges compared with a surplus of $5,380. Gross earnings of Nashville Railway & Light were $205,999, an increase of $16,363, or 8.6 per cent, and surplus was $37,430, an increase of $12,023, or 47.3 per cent. Combined results of the Tennessee Railway, Light & Power Company, the Nashville Railway & Light Company, Tennessee Power Company and the Chattanooga Railway & Light Company for the ten months ended October 31:

	10 Months, 1916	Per cent Increase
Gross earnings	$4,025,882	25.6
Operating expenses	2,228,515	19.9
Net earnings	1,797,367	33.5
Interest and charges	1,204,617	1.4
Balance	592,750	275.8

This balance is at the rate of 6.9 per cent on the $10,250,000 6 per cent cumulative preferred.

Dividends.

	Term	Rate	Payable
Adirondack Elec. Pw., pf.	Q	1.5 %	Jan. 1
Allis-Chalmers, pf.	Q	1.5 %	Jan. 15
Allis-Chalmers, pf.	Acc.	1.5 %	Jan. 15
Am. Cities, pf.	—	1.5 %	Jan. 1
Am. Gas & Elec., pf.	Q	1.5 %	Feb. 1
Am. Gas & Elec., com.	Q	2.5 %	Jan. 2
Am. Gas & Elec., com.	Stk.	2 %	Jan. 2
Asheville Pw. & Lt., pf.	Q	1.75%	Jan. 2
Bangor Ry. & Elec., pf.	Q	1.75%	Jan. 2
Bell Telephone of Canada	Q	2 %	Jan. 15
Boston & Worcester Elec.	S	$1.00	Jan. 1
Brazil Tr., Lt. & Pw., pf.	Q	1.5 %	Jan. 1
Can. Cr.-Wheeler	Q	1.75%	Dec. 31
Can. Cr.-Wheeler, pf.	Q	1.75%	Dec. 31
Carolina Pw. & Lt., com.	—	0.5 %	Feb. 1
Carolina Pw. & Lt., pf.	Q	1.75%	Jan. 2
Columbus Ry., Pw. & Lt., Ser. A., pf.	Q	1.5 %	Jan. 2
Con. Elec. Lt. & Pw., N. O.	—	1 %	Dec. 27
Con. Elec. Lt. & Pw., N. O.	—	1.75%	Dec. 31
Detroit Edison	Q	2 %	Jan. 15
East. Tex. Elec., pf.	S	$3.00	Jan. 2
East. Tex. Elec., com.	S	$2.50	Jan. 2
Elmira Water, Lt. & R. R., first pf.	Q	1.75%	Dec. 31
Elmira Water, Lt. & R. R., first pf.	Q	1.25%	Dec. 31
Ill. Trac., pf.	Q	1.5 %	Jan. 1
Keystone Tel., pf.	Acc.	2 %	Feb. 1
Manhattan Elec. Sup., first pf.	Q	1.75%	Jan. 2
Manhattan Elec. Sup., second pf.	Q	1.75%	Jan. 2
N. Y. State Rys., pf.	Q	1.75%	Jan. 2
N. Y. State Rys., com.	Q	1 %	Jan. 2
No. States Pw., com.	Q	1.75%	Jan. 15
No. States Pw., pf.	Q	1.75%	Jan. 20
Ottawa Lt. & Pw.	Q	1.5 %	Jan. 1
Reading Trac.	—	75c	Jan. 1
Union Pass. Ry., Phila.	—	$4.75	Jan. 1
Utah Pw. & Lt., pf.	Q	1.75%	Jan. 2
West Indies Elec.	Q	1.25%	Jan. 2
Western Union Teleg.	Q	1.25%	Jan. 15
Western Union Teleg.	Ex.	1 %	Jan. 15
West. Phila. Pass.	—	$5.00	Jan. 1
Wisc. Edison	—	$1.75	Dec. 30
Wisc. Edison	Ex.	75c	Dec. 30
Yadkin River Pw., pf.	Q	1.75%	Jan. 2

Reports of Earnings.

AMERICAN POWER & LIGHT.

Susidiaries of American Power & Light Company reported combined revenue with all inter-company accounts eliminated as follows for November and the 12 months ended November 30:

	1916	1915
November gross	$ 782,940	$ 694,901
Net after taxes	374,688	332,293
12 months' gross	8,416,623	7,792,208
Net after taxes	3,931,216	3,552,554

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

Public Service Corporation of New Jersey reports to the New York Stock Exchange, for nine months ended September 30, 1916, as follows:

	1916	1915
Gross revenue	$30,855,916	$41,242,110
Expenses, taxes, etc.	18,863,165	22,094,678
Net revenue	11,992,751	19,147,432
Surplus after charges	1,802,828	1,971,252

BELL TELEPHONE SYSTEM.

October:	1916	1915
Total operating revenue	$23,214,142	$20,314,117
Operating expenses	15,327,743	13,283,355
Net operating revenue	7,886,399	7,030,762
Net after taxes	6,374,705	5,791,184
Ten months:		
Total operating revenue	$217,531,853	$193,738,340
Operating expenses	143,872,217	128,793,719
Net operat'g revenue	73,659,636	64,944,621
Net after taxes	60,239,142	52,775,226
Miles wire owned	19,480,733	18,215,959
Bell stations owned	6,433,235	5,877,438
Total stations	9,724,096	9,030,194

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 18	Dec. 11
American Telephone & Telegraph (New York)	125⅞	128
Commonwealth Edison (Chicago)	141	143
Edison Electric Illuminating (Boston)	220	227
Electric Storage Battery, common (Philadelphia)	69	70
Electric Storage Battery, preferred (Philadelphia)	69	70
General Electric (New York)	172½	179
Kings County Electric (New York)	125	125
Massachusetts Electric, common (Boston)	4¼	4½
Massachusetts Electric, preferred stamped (Boston)	28	28
National Carbon, common (Chicago)	----	----
National Carbon, preferred (Chicago)	----	----
New England Telephone (Boston)	124½	125
Philadelphia Electric (Philadelphia)	31¾	29¾
Postal Telegraph-Cables, common (New York)	----	84
Postal Telegraph-Cables, preferred (New York)	65	65
Western Union (New York)	101¾	102
Westinghouse, common (New York)	55¼	61
Westinghouse, preferred (New York)	----	72

Proposals

ELECTRICAL SUPPLIES.—Bids will be received until December 27 for electric supplies for the public schools of Chicago, Ill., for the period ending June 30, 1917. Committee of Buildings and Grounds, Room 730, Tribune Building.

ELECTRICAL EQUIPMENT.—Sealed bids will be received until December 27 at Room 406, City Hall, Chicago, Ill., for furnishing, constructing, delivering and installing the entire electrical equipment required for a Strauss direct-lift bridge over the south branch of the Chicago River at West Twelfth Street, according to plans and specifications on file in the office of the Department of Public Works.

REMODELING ELECTRIC ELEVATOR.—Proposals will be opened in the Supervising Architect's office, Treasury Department, Washington, D. C., until January 4 for the remodeling of an electric passenger elevator in the United States post office and customhouse at Galveston, Tex., in accordance with the specification, copies of which may be had at that office in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

ELECTRICAL APPARATUS.—Sealed bids will be received until December 29 at Room 406, City Hall, Chicago, Ill., for furnishing and erecting at the municipal power plant, California Avenue and Twenty-sixth Street, one 14-panel generator, transformer and feeder switchboard, with connections to generators, transformers, etc., together with auxiliaries, appurtenances and accessories, according to plans and specifications on file in the office of the Department of Public Works.

Electrical Patents Issued December 12, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,207,718. **Electric Switch.** F. J. Decker, assignor to Shafer-Decker Co., Rochester, N. Y. Foot push.

1,207,719. **Portable Motor-Support.** F. Diehl and H. L. Zabriskie, assignors to Diehl Mfg. Co., Elizabeth, N. J. For sewing machine motors.

1,207,721. **Vehicle Lamp.** L. P. Dixon, New York, N. Y. Illuminated sign and license plate with special provision for renewing and disconnecting lamp.

1,207,732. **Motor-Vehicle Control.** J. B. Entz, Cleveland, O. Dynamo-electric transmission.

1,207,736. **Electromagnetic Device.** O. F. Forsberg, assignor to Western Electric Co., New York, N. Y. Electromagnet has polyphase fluxes.

1,207,744. **Asynchronous Motor.** R. Goldschmidt, Darmstadt, Germany. Has current supplied stator winding, a single-phase rotor winding and a separate stator winding induced from rotor.

1,207,748. **Electric Lantern.** P. Gruner, Pinckneyville, Ill. Dry-battery device.

1,207,753. **Igniter for Gas Engines.** A. B. Herrick, assignor to M. C. Messler, Providence, R. I. Jump-spark plug with make and break operated by engine compression.

1,207,754. **Adjustable-Contact Thermometer.** A. T. Hespe, Weehauken, N. J. Contact closed through mercury.

1,207,771. **Electric Lamp.** E. A. Kuen, assignor to Corcoran Victor Co., Cincinnati, O. Headlight lamp-socket structure.

1,207,812. **Circuit-Controller.** T. G. Stiles, Arlington, N. J. Sliding, drawbridge switch.

1,207,821. **Starter for Internal-Combustion Engines.** G. R. Wadsworth, assignor to Peerless Motor Car Co., Cleveland, O. Switch and clutch for starting motor.

1,207,822. **Electric Ophthalmoscope.** R. H. Wappler, New York, N. Y. Arrangement of reflector and transmitting prism.

1,207,823. **Annunciator.** J. F. Webster, Lineboro, Md. For party-line telephone system.

1,207,828. **Portable Motor-Support.** H. L. Zabriski and G. C. Marx, assignors to Deihl Mfg. Co., Elizabeth, N. J. For sewing machines.

1,207,836. **Connecting System for Telephone Stations.** L. D. Barrows, assignor to American Telephone & Telegraph Co., New York, N. Y. Connection of several stations with line leading to a distant station is controlled at one of them.

1,207,838. **Non-Interference Signal-Box.** C. E. Beach and L. J. Voorhees, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Has signaling train with non-interference magnet.

1,207,861. **Elevator Brake.** W. H. Chapman, Portland, Me. Normally applied brake released by motor-operated cam.

1,207,862. **Process and Apparatus for Neutralizing Static Electricity.** W. H. Chapman, Portland, Me. Material to be neutralized passed through ironized field produced by glow disoharge.

1,207,876. **Electrical Attachment.** H. C. Despard, Syracuse, N. Y. Switch element for electric iron attached to ironing board.

1,207,886. **Metallic-Filament Lamp.** K. Farkas, New York, N. Y., assignor of one-half to A. B. Lisle, Providence, R. I. Metallic-filament, nitrogen lamp.

1,207,912. **Carbon-Brush Connector.** R. F. Hausen, Pittsburgh, Pa. Manner of connecting pig tail to brush.

1,207,915. **Timing Mechanism for Electric Welding.** J. A. Heany, assignor to Royalty Co., Chicago, Ill. Transformer arrangement for effecting voltage variations and varying time of current flow during each voltage variation.

1,207,919. **Liquid-Level Indicator.** C. H. Holway, La Crosse, Wis. Structure of indicator operated by multipolar magnet.

1,207,922. **Battery Economizer.** A. L. Jenks, Minneapolis, Minn. Arrangement of circuits and automatically operated switches.

1,207,923. **Motor Starter.** C. Jewels, Baltimore, Md. Electromagnetically operated resistance-controller.

1,207,944. **Vehicle Direction-Indicator.** W. E. Lemp and E. K. McQuillen, Mobile, Ala. Signaling headlight.

1,207,945. **Advertising Device.** J. J. Lepper, Milwaukee, Wis. Figure of cigar and movable images thereon operated by electric motor and electrically illuminated.

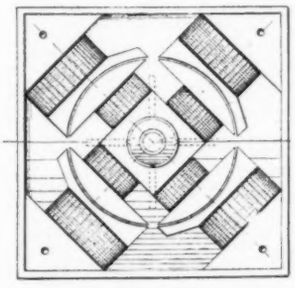
1,207,950. **Rain Signal.** H. A. Lougino, La Grange, Ky. Contacts controlled by rain collected in receptacle.

1,207,952. **Electric Switch and Mounting Therefor.** T. B. Lynch, assignor of one-half to W. C. Morgan, Detroit, Mich. Combined with automobile steering-wheel and adjacent control-lever.

1,207,956. **Casing for Electric Switches.** J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co. For push-button switches.

1,207,957. **Thermostat.** J. F. McElroy, assignor to Consolidated Car Heating Co. Thermally moved element has means for preventing non-thermal vibrations.

1,207,958. **Attachment for Electrical Conduits.** A. McMurtrie, assignor to Thomas & Betts Co., New York, N. Y. Split connector for securing tube to junction box.



No. 1,208,404.—Electric Motor.

1,207,983. **System of Control.** R. C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Mfg. Co. For hoisting apparatus.

1,208,004. **Fuse.** H. L. Reed, assignor to J. E. Crowley, Dorchester, Mass. Cartridge type.

1,208,007. **Burglar Alarm.** O. K. Reynolds, Muskogee, Okla. Circuit arrangement and structure of contact device.

1,208,015. **Hickey.** M. Robinson, Newton, Mass. Structural details.

1,208,017. **Fixture Lamp.** L. H. Rockafellow, assignor of one-half to C. C. Dose, King County, Wash. Ceiling structure with special arrangement of globe and reflector.

1,208,026. **Telemetric System.** A. J. Smith, Bath, Me. Has manually and automatically positioned contacts respectively engaging resistance drums in branch circuits.

1,208,034. **Ignition System.** L. A. Snyder, assignor of one-half to E. N. Jones, Haileyville, Okla. Device for selecting and distributing current to a series of spark-plugs.

1,208,044. **Time-Limit Device for Charging Storage Batteries.** N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Automatic switching arrangement.

1,208,047. **Telegraph Transmitter.** C. G. Taylor, assignor to Telegraph Transmitter Co., Los Angeles, Cal. Rotating disks respectively co-operate with key-actuated contacts.

1,208,048. **Trolley Switch.** J. C. Thompson, Lemoyne, Pa. Switch is actuated by trolley-wire support.

1,208,056. **High-Tension Rectifying Switch.** H. F. Waite, Whitestone Landing, N. Y. Motor operates spark-gap arrangement.

1,208,060. **Electrical Transportation System.** R. C. Weller, S. T. Hyde and P. D. Naugle, Bremerton, Wash. Siding switches are controlled from a car-despatching point.

1,208,074. **Electrical Connecting Device.** F. G. Allen, Erie, Pa. Plug for socket and plug connections.

1,208,095. **Oil Switch.** C. A. Clark, assignor to Wood River Iron Works, New York, N. Y. Special contact arrangement.

1,208,096. **Sounder.** F. W. Cole, Newton Highlands, Mass., assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Electromagnetic device has means for causing armature to come to rest when attracted without producing sound vibrations.

1,208,128. **X-Ray Tube.** C. A. Friedrich, New York, N. Y. Method of expelling gases.

1,208,129. **Alarm for Knobs.** E. J. Fuller, New York, N. Y. Turning of knob closes contacts therein.

1,208,142. **Electric Heater for Bonbon Kettles.** W. S. Hadaway, New Rochelle, N. Y. Receiving jacket has radiant heater units.

1,208,143. **Electric Heating and Lighting Apparatus.** W. S. Hadaway. Combination of radiant heater unit and lighting unit.

1,208,144. **Recording Mechanism.** C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Make-and-break mechanism controlled by clock-operated disk controls printing wheel.

1,208,145. **Printing Meter.** C. I. Hall, assignor to Chicago Electric Meter Co. Printing devices controlled by electricity meter.

1,208,146. **Maximum Indicator for Meters.** C. I. Hall, assignor to Chicago Electric Meter Co. Structural details.

1,208,147. **Clock Construction.** C. I. Hall, assignor to Chicago Electric Meter Co. For use with above.

1,208,151. **Switchboard.** J. P. Haves, assignor of one-half to J. E. Barnhart, Pittsburgh, Pa. Gearing for operating rotatable switch.

1,208,159. **Method and Apparatus for Measuring the Flow of Fluids.** C. W. Humphrey, Chicago, Ill. Amount of expansion of gas and current in resistance element heating same are noted where element and gas are enveloped by flowing fluid.

1,208,183. **Motor Winding.** E. Mattman, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Structure of pole-face winding.

1,208,187. **Apparatus for Generating High-Frequency Electrical Oscillations.** F. H. Millener, Omaha, Neb. Comprises an arc having electrodes in electrolytically generated neutral gas.

1,208,188. **Post-Type Arc-Lamp.** F. H. Miller, assignor to Westinghouse Electric & Mfg. Co. Globe structure for mounting on pedestal.

1,208,195. **Pneumatic Despatch Tube Apparatus.** A. W. Pearsall, assignor to Lamson Co., Boston, Mass. Has special arrangement for controlling pump-driving motor.

1,208,205. **Combined Fire Alarm and Watchman's Signal Transmitter.** C. E. Potter, assignor to Potter Electric Signal & Mfg. Co., St. Louis, Mo. Has key-wound signal-sending train.

1,208,213. **Electric Cooker.** W. Richmond, assignor to J. E. Jenkins, Chicago, Ill. Oven structure.

1,208,226. Control System. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Motor control, with dynamo and storage battery.

1,208,228. Temperature Indicator. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Comprises thermometer-controlled contacts.

1,208,229. Electric Signal System. Nathan H. Suren, assignor to Gamewell Fire Alarm Telegraph Co. Arrangement of boxes, annunciators, etc., in fire-alarm system.

1,208,238. Apparatus for Neutralizing Static Charges. H. C. Tooker and B. S. Hallenbeck, Yonkers, N. Y. Condenser arrangement for neutralizing changes on belts, etc.

1,208,279. Photometer. A. Blondel, Paris, France. Comprises lamp having straight luminous body of small diameter.

1,208,296. Repeater. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. For telephone lines.

1,208,298. Tension Limit for Springs. L. S. Cunny, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Generator suspension device for car trucks.

1,208,302. Vehicle Signaling-Device. R. F. Duryea, San Francisco, Cal. Details of tubular lamp casing.

1,208,304. Dead-Beat Recording Instrument. J. W. Esterling, Indianapolis, Ind. Vibrations of ink-pen are damped by paddle in ink-well.

1,208,305. Vapor Rectifier. S. W. Farnsworth, assignor to Westinghouse Electric & Mfg. Co. Has special arc-controlling barrier.

1,208,351. Vacuum Floor-Cleaner. A. E. Moorhead, San Francisco, Cal. Has beaters and fans operated by electric motor.

1,208,353. Starter for Engines. C. A. Mudge, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. Structure of gearing of motor to engine.

1,208,357. Convertible Lamp and Heater Device. N. G. Nicoll, Brooklyn, N. Y. Lamp pedestal has provision for heater in base.

1,208,384 and 1,208,385. Rectifier. H. K. Sandell, assignor to H. S. Mills, Chicago, Ill. Combination of induction motor and commutator.

1,208,386. Automatic Current-Reversing Mechanism. H. K. Sandell, assignor to H. S. Mills. Pole-changer operated by permanent and electromagnets.

1,208,387. Electric Lamp. A. Schickerling, Mount Vernon, N. Y. Arrangement of reflectors and shade.

1,208,393. Wall Case. E. E. Smart, Hartford, Conn. For switches, junctions, etc.

1,208,400. Waterproofed Material and Method of Producing the Same. A. O. Tate, assignor to Tate Electrolytic Waterproofing Co., New York, N. Y. Fibrous materials are permeated with saponaceous material and a metal sulfate and electrolytically incorporating a metal palmate and a metal hydroxid.

1,208,404. Electric Motor. W. Thomason, assignor of one-half to J. C. Bedigrew, Sapulpa, Okla. Has wound pole-pieces on rotor and stator circumferentially offset. (See cut, previous page.)

1,208,425. System of Gun Control. A. H. Wegner, assignor to Wegner Control System, Portsmouth, N. H. Motor operating main gun is controlled by auxiliary gun.

1,208,427. Two-Wire Horn Button-Switch. S. O. White, assignor to Warner Gear Co., Muncie, Ind. Mounted on hub of control handle.

1,208,429. System of Electric Propulsion. M. J. Wightman, assignor to General Electric Co., Schenectady, N. Y. For driving propellors of vessel.

1,208,441. High-Speed Rotating Body. E. F. W. Alexanderson, assignor to General Electric Co. Means for damping shaft vibrations of rotor. (See cut.)

1,208,448. Electric Cutout. W. Arthur, assignor to General Electric Co. Has fuse of metallic cadmium.

1,208,450. Semi-Automatic Steering-Gear Operating Mechanism. F. W. Austin, Cabool, Mo. Electrically operated gear controlled by steering wheel of automobile.

1,208,451. Elevator. W. D. Baldwin and F. C. Furlow, assignors to Otis Elevator Co., Jersey City, N. J. The respective connection of several cars with continuously rotating shaft is electromechanically controlled.

1,208,456. Headlight. L. Bell, West Newton, Mass. Structure of screen.

1,208,460. Expansion Ring for Electric Motors. D. W. Bisbee and P. A. Cressey, Nacozari, Mexico. Special self-starting winding on poles of synchronous motor.

1,208,473. Protecting Means for Electric-Distribution Systems. G. A. Burnham, assignor to General Electric Co. Arrangement of reverse-current relays and series transformers for distribution in parallel transmission lines.

1,208,474. X-Ray Screening Apparatus. E. W. Caldwell, New York, N. Y. Comprises apparatus automatically starting and stopping the operation of the tube according to the operation of a movable screen.

1,208,479. Spark-Plug. F. Carlson, North Easton, Mass. Details.

1,208,480. Control Apparatus for Fuel Supply for Internal-Combustion Engines. T. F. Casey, assignor of one-half to O. Horstman, New York, N. Y. Alarm circuit is controlled by positions of fuel-supply valves.

1,208,484. Lightning Arrester. R. P. Clark, Shelter Island, N. Y. Has automatic control of resistance in series with electrolytic condenser.

1,208,487. Dimmer. W. E. Cochran, assignor to Art Metal Mfg. Co., Cleveland, O. For mounting on lamp bulbs.

1,208,492. Illuminated Sign Device. A. F. Conner and G. L. Willett, assignors to T. Cusack Co., Chicago, Ill. For mounting on lamp bulb.

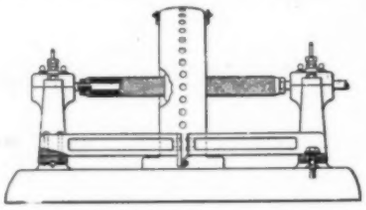
1,208,499. Means for Protecting Electric Systems. E. E. F. Creighton, assignor to General Electric Co. Has feeders for impressing testing potential on system to develop incipient faults and means for selecting faulty feeder.

1,208,504. Combined Dash and Trouble Lamp. C. F. Cuno, assignor to Cuno Engineering Corp., Meriden, Conn. Lamp may be withdrawn from socket and reel supplies connecting cord.

1,208,508. Tire-Deflating Indicator. Stockwell G. Dare, Whitestone, N. Y. Structure of circuit-closer for operation by tire.

1,208,512. Method of and Apparatus for Recording Electrical Quantities. J. T. Dempster, assignor to General Electric Co. Record sheet is actuated by watt-hour meter element and curve is drawn by indicating wattmeter element.

1,208,517. Arc Lamp. J. L. Dinsmoor, assignor to C. B. Dinsmoor, Windham, N. H. Details of electromagnetic feeding mechanism.



No. 1,208,441.—High-Speed Rotating Body.

1,208,526. Pivot and Jewel for Measuring Instruments. A. L. R. Ellis, assignor to General Electric Co. Method of rounding pivot point of glass hard steel and forming jewel therefor.

1,208,530. System of Distribution. G. Faccioli, assignor to General Electric Co. Alternator is connected to line first through resistance and then to resistance and inductance in parallel to prevent high-frequency disturbances.

1,208,540. Lamp. F. L. Godinez, assignor to G. C. Lynch, New York, N. Y. Lamp standard with superposed indirect-lighting units.

1,208,543. Lamp Grip. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Receptacle has prong preventing rotation of plug after it has been inserted.

1,208,547. Arc Lamp. N. A. Halbertsma, Darmstadt, Germany. Special arrangement of carbons in continuous direct current arc lamp.

1,208,553. Lamp. E. A. Hawthorne, Bridgeport, Conn. For securing to dry cell.

1,208,559. Guard for Electric Switches. F. W. Horn, Lester, Pa. For knife-switches to prevent contact of operator therewith.

1,208,564. Continuous Trolley Connections for Bridges. T. Jenkins, assignor of one-half to J. Milo, New York, N. Y. One of conductors has swinging frog for engaging the other.

1,208,566. Telephony. M. L. Johnson, assignor to F. B. Cook Co., Chicago, Ill. Arrangement of operator's sets, link circuits, selector switches, recorders, etc., at exchange.

1,208,571. Electric Switch Mechanism. C. Kingan, assignor of one-half to J. T. Middleton, Edinburg, Ind. For combination of alternating and direct-current circuits.

1,208,575 and 1,208,576. Electric Switch. F. Kraemer, assignor to Pan-American Electric Tool Co., Milwaukee, Wis. First patent: Plunger-operated. Second patent: For mounting in tool handle.

1,208,577. Solenoid. F. Kraemer, assignor to Pan-American Electric Tool Co., Milwaukee, Wis. Sectional-coil structure.

1,208,583. Switch Mechanism. D. C. Larson, assignor to Otis Elevator Co., Jersey City, N. J. Contacts operated by roller arm.

1,208,584. Electrogalvanizing Apparatus. A. Laughlin, Jr., Sewickley, Pa. Structure of tank, conveyor, etc.

1,208,597. Enclosed-Arc Device and Method of Operating the Same. G. M. J. Mackay, assignor to General Electric Co. Has tungsten cathode, asgon filling and chemical active with respect to water vapor.

1,208,607. Multiple-Car Elevator System. W. F. Mayer and A. Sundh, Hastings-upon-Hudson, N. Y. Electrohydraulic.

1,208,626. Testing Device. R. H. Nickerson and G. G. Courtney, Plymouth, Mass. Hand circuit-tester including battery.

1,208,629. Metal-Filament Manufacture. O. Oberlander, assignor to General Electric Co. Manufacture of tungsten filaments.

1,208,637. Electric Cooking Apparatus. S. I. Phelps, Buchanan, Mich. Oven structure.

1,208,644. Variable-Speed Gearing. G. Pollard, assignor to Menco Elam Syndicate, Limited, England. Electromagnetically controlled.

1,208,656. Signaling Device. T. Richardson, assignor to G. Downin, New Orleans, La. Electromagnetically operated automobile signal.

1,208,660. Junction or Outlet Box. M. Robinson, Newton, Mass. Details of construction.

1,208,676. Electric Pneumatic Time-Switch. O. Smiley, E. C. Applegate and G. R. Bennett, Fort Wayne, Ind. Structural details.

1,208,682. Electrical Switching Device. M. H. Slielman, New York, N. Y. For handle of hand lamp.

1,208,691. Thermostatic Heat-Controlling Means. C. Stickle, Indianapolis, Ind. Thermal circuit-closer controlled by heat of liquid.

1,208,699. Train-Stopping System. W. E. Tibbitt, assignor of one-fourth to G. L. Townsend, Jr., Wilmington, Del., and one-fourth to H. B. Maston. Train-control valve electrically controlled by signal and at will.

1,208,704. Feeder Regulator. M. Unger, assignor to General Electric Co. Details of operating gearing.

1,208,718. Telephone System. A. H. Dyson, assignor to Kellog Switchboard & Supply Co. Party-line exchange.

1,208,722. Electrolytic Cell. D. Shaw, New York, N. Y. Structure of receptacle and gas outlet.

PATENTS EXPIRED.

The following United States electrical patents expired on December 19, 1916:

639,235. Conduit Plow. E. M. Hewlett, Schnectady, N. Y.

639,252. Contact Shoe for Surface-Contact Railways. M. T. A. Kubierschky, Berlin, Germany.

639,276. Electric Transformer. J. W. Packard, Warren, O.

639,291. Automatic Telephone. E. E. Ries, New York, N. Y.

639,443. Electrically Driven Spindle. H. B. Sawyer, Newton, and Russell Robb, Concord, Mass.

639,447. Polyphase Alternating-Current Magnet. W. M. Scott, Philadelphia, Pa.

639,450. Governor Mechanism. R. Shirreffs, Richmond, Va.

639,459. Electric Ground-Detector for Constant-Current Arc-Light Circuits. J. F. Stevens, Philadelphia, Pa.

639,464. Coupling for Electric or Other Wires. R. Thompson, Newark, N. J.

639,505. Electrical Transformer. A. F. Berry, Market-Harborough, England.

639,526. Apparatus for Telephonic Systems. F. B. Cook, Chicago, Ill.

639,527. Drop-Restoring Device for Telephone Switchboards. F. B. Cook, Chicago, Ill.

639,528. Telephone Transfer Board. F. B. Cook, Chicago, Ill.

639,557. Electrical Snap-Switch. M. Guett, Hartford, Conn.

639,590. Electric Transformer. A. H. Loring, Minneapolis, and H. L. Clark, St. Paul, Minn.

639,652. Secondary Battery. O. Behrend, Frankfort-on-the-Main, Germany.

639,688. Circuit-Breaker or Line-Opener. F. C. Robertson, Toronto, Canada.

639,690. Electric Cane. W. N. Sherman, Merced, Cal.

Design 32,003. Incandescent Lamp Socket. R. Meyer, New York, N. Y.

Design 32,004. Electric-Armature Mounting. J. H. Mason, New York, N. Y.

Designs 32,019-20-21-22. Rail Bond. C. J. Mayer, Philadelphia, Pa.